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GOIDÀNICH (G.). **Le alterazioni cromatiche parassitarie del legname in Italia.** [Staining of timber in Italy.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, pp. 363–388, 1 fig., 1935.

In this paper (which is intended to serve as an introduction to a forthcoming account of his own researches on the subject) the author reviews the history of earlier investigations into timber-staining fungi, discusses the causes that produce staining (i.e., colour of the hyphae themselves, pigments produced by the fungi, and pathological effects on the tissues), and gives notes on the biology of the fungi concerned and their genera and species. He considers that the organisms causing tracheomycosis (e.g., *Verticillium albo-atrum* and *Graphium* [*Ceratostomella*] *ulmi*) [see next abstracts] should be regarded as staining fungi, as, apart from the anatomical characters of the infected tissues, the effects produced by these fungi amount to staining.

Species of *Ophiostoma* [*R.A.M.*, xiv, p. 703] have been isolated from oak near Rome, causing a dark brown discoloration due to the numerous tyloses formed in the tracheids. The author considers that the tyloses act as a mechanical barrier against the advance of hyphae, and at the same time by shutting off the access of air and water to the vessels they set up conditions which render the continued existence of the parasite impossible.

The paper concludes with an account of the part played by insects in the transmission of staining fungi and a brief discussion of the amount of damage caused by the latter.

WORTHLEY (L. H.) & LIMING (O. N.). **Dutch Elm disease eradication in the United States.**—*J. econ. Ent.*, xxviii, 3, pp. 524–528, 1935.

After giving a brief outline of the history of the Dutch elm disease (*Ceratostomella ulmi*) [*R.A.M.*, xv, p. 126] in Europe and of its discovery in the United States, as well as a concise account of its symptoms, the author states that recent investigations have shown the existence of over 7,600 elms affected with it in the major infection centres in New Jersey, New York, and Connecticut [ibid., xiv, p. 406]. Isolated infected trees have also been found in Cleveland, Cincinnati, Baltimore, Indianapolis, Norfolk, and Old Lyme, Connecticut. The elm bark beetle *Scolytus multistriatus* has been collected from the general

area east of Harrisburg, Pennsylvania, north of the New Jersey-Delaware State line, and south of the Massachusetts-Vermont State line, while the American bark beetle, *Hylurgopinus rufipes*, with habits somewhat similar to those of *Scolytus*, occurs throughout the northern elm area in the United States; other insects may also be involved in the transmission of the disease. *S. scolytus* is not known to be established in the United States.

Some details are given of the work now in progress for the eradication of the Dutch elm disease from the United States, as well as of plans for the future.

BEATTIE (R. K.). **Research during 1934 on Ceratostomella ulmi, the cause of the Dutch Elm disease.**—*J. econ. Ent.*, xxviii, 3, pp. 528–531, 1935.

The author states that researches in 1934 tended to confirm the hypothesis that the Dutch elm disease (*Ceratostomella ulmi*) [see preceding abstract] was introduced into the United States with shipments of elm logs from Europe. Additional infected trees were found at Cleveland and Indianapolis, all more or less in the proximity of veneer factories using European elm material, or of railways transporting imported elm logs from the ports of entry. The facts that the trees at Cleveland were found to contain the fungus in annual rings starting with that formed in 1929, and one of the trees from Indianapolis showed the organism in its 1926 annual ring would indicate that these trees were first infected in those years, since there is no evidence that the *Graphium* may spread from a younger to an older ring. The 1926 infection in Indianapolis is the oldest yet discovered in America. A possible explanation of the position in Indianopolis may be the presence in the region of a few undiscovered *Scolytus* beetles transmitting the disease, although the vicinity is reputed to be free from these beetles.

Apart from elm logs the possibility also exists of the disease having been imported into the United States with cheap crockery which, in certain parts of Staffordshire, England, is packed in crates made of unbarked wood of miscellaneous trees, including elm; five out of fifteen such crates showed on arrival in New York brown streaks in the young wood and contained living larvae of *S. multistriatus*, but attempts to isolate *Graphium* from the wood were unsuccessful. During 1934 specimens from 16,872 suspected elm trees were examined and of these 49 per cent. gave cultures of *Graphium*, 33 per cent. yielded a *Cephalosporium*, and 4 per cent. a *Verticillium*.

ROY (A.). **La Corse forestière.** [Sylvan Corsica.]—15 pp., 2 pl., 1 map, *Bull. Com. For., Paris*, June, 1935. [Abs. in *Rev. Eaux For.*, lxxiii, 6, p. 552; 10, p. 930, 1935.]

In connexion with a general study of Corsican silviculture it is stated that the wild chestnuts occurring sporadically in the forests situated on mountain slopes have so far remained entirely free from the ink disease [*Phytophthora cambivora*: *R.A.M.*, viii, p. 151; xiv, p. 264] which is devastating the valley plantings.

MÜNCH (E.). **Das Lärchenrätsel als Rassenfrage. Zweite Mitteilung : Die Lärche im Seeklima.** [The Larch riddle as a question of strain. Second note: the Larch in the maritime climate.]—*Z. Forst- u. Jagdw.*, lxvii, 8, pp. 421–442; 9, pp. 483–500, 7 figs., 1935.

This is a very comprehensive and fully documented survey of the position occupied by the larch in maritime climates, with special reference to the bearing of silvicultural factors on the predisposition of the trees to the so-called 'larch disease' or 'larch die-back', a frequent but apparently quite independent concomitant of canker [*Dasyscypha willkommii*: *R.A.M.*, viii, p. 2; xiii, p. 482]. The disorder, which has been found to be most prevalent and destructive on 20- to 30-year-old trees, consists essentially in progressive desiccation of the branches, mostly from the base upwards, and may assume either a chronic or acute form, the dead and injured bark being frequently covered with a dense mass of lichens. Recovery from the disease is rare.

The careful inspection of numerous old larch stands in excellent condition has clearly shown that certain larch strains are admirably adapted to the exigencies of the maritime climate of the countries adjoining the North Sea and Baltic Sea. In Great Britain and Scandinavia the Scottish strain thrives, while for the east and north-east of Germany seed from the Sudetic Alps may be recommended, die-back among Sudetic larch stands being quite exceptional. The striking contrast between the healthy old (over 80 years) stands and the sickly younger ones that have grown up since 1880 or thereabouts is thought to be explicable by the importations of cheap seed from unfavourable localities. The use of larch seed from the Sudetic Alps or other approved sources is regarded as the sole means of maintaining the stands in a healthy condition, and should such seed not be available it would be preferable temporarily to discontinue the cultivation of the tree rather than procure planting material from the Tyrol.

RUDGE (E. A.) & LEWIS (H.). **An inquiry into the mechanism of decay of wood. Part II.**—*J. Soc. chem. Ind., Lond.*, liv, 36, pp. 302 T–305 T, 1935.

Analytical determinations [the data of which are tabulated and discussed] of the major constituents (cellulose, 'hemicelluloses', and lignin) of spruce, tulip wood [*Liriodendron tulipifera*], and elm samples treated with water, calcium carbonate, or carbon dioxide at 65° C. showed the chief symptoms of incipient decay by infiltration (as distinct from that of fungal origin) [*R.A.M.*, xiv, p. 668 and next abstract] to be an increase of alkali-soluble matter, accompanied by a decrease of cellulose and lignin. The degradation of the water-treated wood may be partially attributable to the presence of calcium salts in the tissues themselves, especially those of elm, which suffered the heaviest damage from this treatment. The practical implications arising out of these results are discussed in some detail.

NORMAN (A. G.). **The mechanism of decay in wood.**—*J. Soc. chem. Ind., Lond.*, liv. 38, pp. 854–855, 1935.

After criticizing the experimental methods used by Rudge in his attempt to prove that decay in wood is an accompaniment of mineral

infiltrations [see preceding abstract], the writer sums up as follows the present position of the controversy between the adherents of this theory and the professional wood chemists. Rudge has clearly demonstrated the accumulation in many different samples of decayed wood of inorganic salts, especially calcium and aluminium, but has furnished no evidence that this process is intimately connected with genuine decay under conditions absolutely precluding microbiological involvement. There is nothing to show that the infiltration is not a secondary process, and the presence of calcium salts may, in fact, even assist the progress of biological decay by neutralizing the organic acids commonly formed by wood-destroying fungi. It is concluded that, in the absence of direct proof of purely chemical action by inorganic salts at ordinary temperatures, the infiltration theory cannot supersede the orthodox biological explanation of wood decay, or even be accepted as complementary to the latter.

Rust (S. F.). **Some aspects of wood preservation in Australia and U.S.A.** —*J. Brit. Wood Pres. Ass.*, v, pp. 43–68, 1935.

In the first part of this paper, which was read at a meeting in 1935 of the British Wood Preserving Association, the author states that owing to the high degree of natural resistance to decay of the great bulk of timber grown in Australia, wood preservation with coal tar creosote under high pressure has not been employed so far on a commercial scale in the Commonwealth. The comparatively small proportion of the timber that has been subjected to preservation until now was treated either by the 'Powellizing' [*R.A.M.*, viii, p. 80; xi, p. 686] or by the fluorizing process (i.e., boiling the green timber in a solution of sodium fluoride, arsenious oxide, and sodium dinitrophenate) [ibid., xi, p. 617], although earlier superficial treatment by dipping in, or brushing with, creosote, or charring had been applied [ibid., xiv, p. 806]. The standard treatment of poles by the postal authorities is to brush the poles 12 to 18 in. above and below soil level with Stockholm tar, gas tar, and slaked lime (3–7–3). The persistent demand for industrial timber, however, as instanced by the fact that the annual replacements of poles and railway sleepers alone involve a sum in excess of £1,000,000, coupled with the depletion in decay-resisting timber supplies, is increasingly drawing attention to the wood preservation problem in Australia. At present service tests of timbers and treatments are being carried out, and the preservative values of Australian creosotes are being ascertained; analyses of the oil are made according to the standard methods of the American Wood Preservers' Association, and a tentative specification has been prepared and published. Four years' service tests of fluorized sleepers have shown 99·1 per cent. to be still in good condition, compared with only 62 per cent. for the controls. The treatment of fence posts [loc. cit.] with creosote plus crude oil or zinc chloride plus arsenic resulted in sound posts after 3½ years, while the controls were badly decayed. In posts treated with sodium fluoride and arsenic the decay increased with the rainfall.

In the second part a brief review is made of the wood preservation methods observed by the writer during his tour through the United States [most of which have been noticed from time to time in this *Review*].

THOMAS (A. V.). **Wood preservation in Malaya.**—*J. Brit. Wood Pres. Ass.*, v, pp. 76–78, 1935.

This is an abridged version of the author's recent report on the wood preservation methods used in Malaya [*R.A.M.*, xiv, p. 484].

HARKOM (J. F.). **Cross-ties used by Canadian railways.**—*J. Brit. Wood Pres. Ass.*, v, pp. 79–88, 2 pl., 1935.

After a brief indication of the climatic and other environmental conditions to which railway sleepers are subjected in Canada, the author gives details of their production in that Dominion, including preservation. Apart from a limited number treated with zinc chloride, which are destined for use in Alberta and Saskatchewan, the sleepers are usually treated at present in the east with a mixture consisting of 70 per cent. creosote and 30 per cent. tar, and in the west with a mixture of 70 to 50 per cent. creosote and 30 to 50 per cent. crude oil. Since the adoption of the incising process of the sleepers [ibid., xii, p. 342], the net absorption was reduced from 8 to 10 lb. per cu. ft. before 1924 to 6 lb., but some plants still keep it at 8 lb., the general custom being to increase the net absorption by at least 1 lb. when using the 50–50 creosote-crude oil mixture. Treating schedules for the different species of timber used in Canada are shown in a table. A list is also given of the percentages of sleepers laid down which were treated in the years from 1922 (16·7) to 1932 (33·1), with a maximum in 1931 (38·7), the average cost per sleeper varying from $1·59 to $1·36 for the treated to $0·753 to $0·634 for the untreated. The service life of the sleepers is estimated to have been increased by treatment from 3 to 4 years for beech, yellow birch [*Betula lutea*], and hard maple [*Acer saccharum* and *A. nigrum*], 5 to 6 years for red oak [*Quercus rubra*], 4 to 7 for hemlock [*Tsuga canadensis*], and 5 to 8 for jack pine [*Pinus banksiana*] sleepers to 18 to 20, 15 to 25, 15 to 20, and 15 to 20 years, respectively.

FINDLAY (W. P. K.). **A standard laboratory test for wood preservatives.**—*J. Brit. Wood Pres. Ass.*, v, pp. 89–93, 1935.

This is an abridged description of the 'gravimetric' method which was recommended for testing wood preservatives at the International Conference of Mycologists and Wood Preservation Technicians in 1930 at Berlin, an account of which has already been noticed from another source [*R.A.M.*, xiv, p. 411].

PALM (B. T.). **Rumex acetosella, spontan värdväxt för Bacterium (Pseudomonas) tumefaciens.** [*Rumex acetosella*, a spontaneous host of *Bacterium* (*Pseudomonas*) *tumefaciens*.]—*Svensk bot. Tidskr.*, xxviii, 4, pp. 465–467, 1 fig., 1934. [English summary. Received November, 1935.]

The annual sporadic occurrence of crown gall (*Bacterium tumefaciens*) on sugar beets [*R.A.M.*, xiv, p. 686] in southern Sweden is stated to be of no economic importance, so that the recent detection of the pathogen on *Rumex acetosella*, a common weed on acid soils, in several localities of Scania is of purely scientific interest. Inoculation experiments with the organism from *R. acetosella* on the roots of the current

season's plants gave positive results in 4 out of 20 cases, the corresponding figures for the young lateral branches of seed beets being 5 out of 10. Similar galls were observed on *Campanula rotundifolia* growing near the affected *Rumex* plants in one district.

PIERCE (W. H.). **The inheritance of resistance to common Bean mosaic in field and garden Beans.**—*Phytopathology*, xxv, 9, pp. 875–883, 2 figs., 1935.

A tabulated account is given of the writer's studies at the Idaho Agricultural Experiment Station on the inheritance of resistance to common bean [*Phaseolus vulgaris*] mosaic [*R.A.M.*, xiv, p. 810] in crosses involving three resistant varieties, viz., Corbett Refugee, Robust, and Great Northern UI No. 1, and one susceptible, Refugee Green.

All hybrids derived from Corbett Refugee showed resistance to the disease in the F_1 generation, whereas the F_1 progeny of crosses of Great Northern UI No. 1 and Robust with Refugee Green were susceptible. In the F_2 generation the Corbett Refugee × Refugee Green hybrids segregated 89 per cent. resistant plants when the former was used as the male parent, 82 per cent. resistant being yielded by the reciprocal cross. The F_2 progenies of Great Northern UI No. 1 × Refugee Green segregated 15 to 18 per cent. resistant plants, and Robust × Refugee Green 12 per cent. Crosses between certain resistant varieties segregated susceptible plants in the F_2 generation—Corbett Refugee × Great Northern UI No. 1, 11·4 per cent. and Corbett Refugee × Robust, 20·8. Great Northern UI No. 1 × Robust did not segregate in the F_2, indicating that the resistance of these two varieties is of a similar type. Back-crossing tests to Refugee Green with two homozygous resistant varieties, Idaho Refugee and Wisconsin Refugee, selected from the Refugee Green × Corbett Refugee cross, showed them to possess the same degree of resistance as the original resistant parent, Corbett Refugee.

The data from these inheritance trials were sufficiently consistent to admit of fairly accurate predictions as to the performance of crosses between resistant and other varieties.

CURZI (M.). **'Dematophora glomerata' Viala e 'Vialina' n.gen.** [*Dematophora glomerata* Viala and *Vialina* n.gen.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 2, pp. 235–259, 9 figs., 1935. [English summary.]

In this revised and expanded account of his investigations into the specific complexity of *Dematophora glomerata* [*R.A.M.*, xiv, p. 195] the author identifies the sclerotial form mentioned by Viala with *Microascus intermedius* Emmons & Dodge (*Mycologia*, xxiii, p. 324, 1931), and names the pycnidial form [with Latin diagnoses of the genus and species] *Vialina glomerata* n.gen., n.sp. (= *D. glomerata* p.p.). The genus resembles *Chaetasbolisia* Speg. but differs from it in having hairy instead of setulose pycnidia. In culture the dark hyphae of *V. glomerata* measure 1·5 to 3·5 μ in diameter as against 2 to 2·75 μ on the host. The sparse, globose or spherical, fuliginous to black pycnidia, 100 to 250 μ in diameter, have a thin hairy wall and a minute, impressed ostiole. The pycnospores [*R.A.M.*, xiv, p. 196] arise at the

apex of cylindrical or conical sporophores or directly from the wall of the pycnidium. Inoculation tests on vine plants in 1932 and 1933 indicated that the fungus does not cause disease and is probably only a soil saprophyte.

Roots of *Chrysanthemum cinerariaefolium* affected by a rot previously described [ibid., xiii, p. 396] showed the presence of the mycelium of a *Vialina* with chestnut or fuliginous, branched hyphae 2 to 3 μ in diameter, with piriform swellings 3·75 to 7·5 μ thick at the septa. The fungus formed clusters of uni- or pluricellular chlamydospore-like bodies 5 to 10 μ in diameter. The superficial, globulose, sometimes aggregated, hairy, ostiolate pycnidia measured 150 to 300 μ in diameter and the cylindrical, hyaline, continuous pycnospores 4·75 to 5·75 by 2 μ. The fungus is named *V. radicicola* n.sp. [with a Latin diagnosis].

FAES (H.). **Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. Rapport annuel 1934.** [Annual report for 1934 of the Federal Viticultural Experiment Station at Lausanne and Domaine de Pully.]—*Landw. Jb. Schweiz*, xlix, 6, pp. 619–664, 13 figs., 1 graph, 1935.

This report contains a number of items of phytopathological interest [cf. *R.A.M.*, xiii, p. 77], of which the following may be mentioned. Indisputable evidence was obtained of the efficacy of late (August–September) applications of copper-containing preparations in the control of apple scab (*Venturia*) [*inaequalis*], delayed attacks of which were favoured by the September dews [ibid., xiv, p. 111]. These compounds, however, are liable to cause severe burning of the foliage and russeting of the fruits [ibid., xv, p. 73], the keeping quality of certain varieties of which is thereby impaired.

The best control of the *Fusarium* disease of China asters [*Callistephus chinensis*: see below, p. 156] in a market-garden was given by soil sterilization with formalin 15 days before sowing. Promising results were also given by experiments in steam sterilization of the soil.

At Belle-Ferme near Payerne the incidence of heart rot of beets was reduced from 15 to a maximum of 3 per cent. by the incorporation of boric acid or borax with the soil [see below, p. 190].

Copper carbonate, ceretan [ceresan], and tillantin R dusts were the most satisfactory of various substances used for the general disinfection of spinach, peas, bean [*Phaseolus vulgaris*], lettuce, tomato, celery, onion, cabbage, carrot, and beet seeds [ibid., xiii, p. 609].

Good control of *Rhizoctonia* [*Sclerotium*] *tuliparum* [ibid., xiii, p. 493] on tulip, hyacinth, and narcissus was given by three hours' immersion of the bulbs in 1 per cent. formalin or 0·5 per cent. uspulun at 44° C.

DESAI (S. V.). **Phytopathology.**—*Biochem. Res. India 1934*, pp. 53–60, 1935.

The results of studies on some important phytopathological problems in India carried out during 1934 are briefly reported. All the investigations mentioned have been noticed in this *Review* from other sources.

PARK (M.). **Report on the work of the Mycological Division.**—*Adm. Rep. Dir. Agric., Ceylon, 1934*, pp. D124–D131, 1935.

This report [*R.A.M.*, xiv, p. 145] contains, *inter alia*, the following items of phytopathological interest.

In the wetter parts of Ceylon, particularly on those estates where control measures were neglected during the financial depression, *Fomes lignosus* and *Ustulina zonata* [ibid., xiii, p. 593] continue to attack *Hevea* rubber.

In one locality, young chilli [*Capsicum annuum*] plants were widely attacked by *Cercospora capsici* [ibid., xi, pp. 605, 804], this being the first definite record of the disease in Ceylon; in another district the same host was attacked by little leaf [ibid., xii, p. 77]. The latter condition is marked by an abundant production of dwarf leaves, badly affected plants often dying back. Diseased plants seldom fruit, and when they do the fruits produced are small and distorted. That the disease may be due to a virus was indicated by the presence of similar symptoms on *Solanum nigrum* and *S.* (*?*) *laeve* in the vicinity. The severity of the outbreak, which affected nearly 100 per cent. of the plants over an area of five acres, is attributed to an insufficiently long rotation period.

The control of citrus canker (*Pseudomonas citri*) [ibid., xiv, p. 145] continues to be a major problem in the development of citrus, and especially of grapefruit, plantations. The attempt at control begun in 1933 by systematic spraying and removal of all affected parts was continued with satisfactory results. A similar trial was conducted in 1934 on 94 four-year-old grapefruit trees. The first collection of diseased leaves necessitated almost stripping the trees bare. Spraying was carried out with lime-sulphur and with soap-colloidal sulphur-nicotine and with the advent of the rains the trees recovered. The results of the two experiments indicate that by the systematic destruction of all diseased material combined with thorough spraying the incidence of grapefruit canker caused by *P. citri* can be so reduced as no longer to occasion alarm.

Citrus mildew (*Oidium tingitaninum*) [ibid., xii, p. 689; xiv, p. 153] was very prevalent early in the year; the use of colloidal copper against the fungus is stated to be increasing. The fungus previously reported as causing anthracnose of young orange fruits [ibid., xiv, p. 146] was identified as a strain of *Colletotrichum gloeosporioides*. Citrus was also attacked by brown root (*Fomes lamaoensis*) [*F. noxius*: cf. ibid., xv, p. 78].

Bunchy top of plantains [ibid., xiii, pp. 78, 112, 642] continued to cause much damage, especially in large plantations. In one area of over 200 acres where plantains were grown as a catch crop in a reafforestation scheme, 90 per cent. of the clumps were estimated to be diseased four years after planting, many of the suckers used being already diseased when planted.

Further infections of coco-nuts by leaf-bitten disease [ibid., xv, p. 15] were noted, but the prompt application of control measures arrested further progress. Wound inoculations with pure cultures of *Thielaviopsis* [*Ceratostomella*] *paradoxa* at the base of the youngest unfolding

leaf gave positive results in five days; infection, however, was localized, and did not involve the bud. No infection occurred in unwounded, inoculated leaves. When an aqueous spore suspension of the fungus was injected into a point near the bud, infection developed in two days and spread rapidly. The young leaves soon wilted, and the tree gave every indication of being infected with bud rot [*Phytophthora palmivora*: ibid., xiii, p. 79; xv, p. 15]; the advent of dry weather checked any further progress of the disease, and the tree made a good recovery.

Attempts were made to control the coco-nut beetle *Oryctes rhinoceros* by using traps infected with the insectivorous fungus *Metarrhizium anisopliae* [ibid., xiii, p. 94]; pits about 2 ft. square and 1½ ft. deep were filled with coco-nut debris plus fresh cattle dung and inoculated with cultures of the fungus on boiled rice. The fungus attacked and killed all larvae in the infected traps. Young larvae continued to appear, but soon became infected and died. On one occasion, six months after inoculation an egg was found in one trap together with young infected larvae, from which it would appear that infected traps may continue to attract the females and that one inoculation supplies infectious material for many months. Observations are being continued.

The fungus causing ginger soft rot [ibid., xiv, p. 146] was identified by S. F. Ashby as *Pythium graminicolum* [ibid., xiii, p. 494]. 'Seed' ginger treated by immersion in 0·1 per cent. mercuric chloride for two hours either just after harvesting or just before sowing yielded many more plants than untreated seed.

Other records include wet weather mould of rice (*Cladosporium* (*?*) *miyakei*) [ibid., xii, p. 147], rust (*Woroninella umbilicata*) of pigeon pea, *Corticium salmonicolor* on *Anona muricata*, *Pseudoperonospora cubensis* on cucumber, and *Gloeosporium musarum* and *Macrosporium musae* on *Musa cavendishii*, the four last records being new for Ceylon.

PARHAM (B. E. V.). **Annual report of general mycological and botanical work for 1934.**—*Annu. Bull. Dep. Agric. Fiji*, pp. 55–56, 1935.

In 1934, a black fruit spot appeared in tinned pineapples in Fiji, as a result of infection before picking which had not become visible until after the fruit had been processed. The connexion of the spots with the floral cavities was established, and the disease was ascertained to be associated with *Ceratostomella paradoxa*, a *Penicillium*, and a *Helminthosporium*; it was similar to the black eye spot reported from the West Indies [cf. *R.A.M.*, xiii, p. 80; xiv, p. 456]. Infection had spread from the heaps of rejected fruits left in the field to rot. Pineapple soft rot (*C. paradoxa*) [ibid., xi, p. 192; xiv, p. 455] was also noted.

A leaf and stem wilt of yams (*Dioscorea* sp.) due to *Gloeosporium pestis* Massee [ibid., ix, p. 429] caused failure of tuber production.

Yagona (*Macropiper* [*Piper*] *methysticum*) wilt, first observed in 1933, spread rapidly during 1934, when out of some 2,000 acres in the affected area 252 were destroyed by the disease and 113 severely affected. Laboratory studies resulted in the isolation of a bacterium as the probable primary cause, with a *Fusarium* and a *Neocosmospora* or a closely allied Ascomycete as secondary parasites. The primary wilt is

followed by a secondary stage characterized by leaf fall and a die-back of the ultimate shoots.

Ginger soft rot (*Pythium gracile*) [cf. ibid., x, p. 591] was recorded for the first time in Fiji.

Botany.—*Rep. Pa agric. Exp. Sta., 1934–35* (*Bull.* 320), pp. 18–21, 1 fig., 1935.

During the period under review a new pear variety, Richard Peters, was produced in Pennsylvania, which in spite of repeated inoculations has remained immune from fireblight [*Bacillus amylovorus*: cf. *R.A.M.*, xiv, p. 318]. It is very vigorous, the fruit resembling the Bartlett pear, to which it is about equal in quality; its chief value, however, is that it may become a progenitor of other resistant and better varieties. Several hundred seedlings are being grown from crosses between the new variety and Bosc, as well as other standard pears.

The optimum, maximum, and minimum P_H values for the growth of the fungus causing 'truffle' disease [*Pseudobalsamia microspora*: ibid., xiv, p. 739] of mushrooms were ascertained to be 6·8, 7·55, and below 3·75, respectively; this range indicates that the organism does not spread in composting manure, though it can remain dormant therein, later being carried into the mushroom houses. It may, perhaps, grow in old manure the P_H value of which is below neutrality.

An early potato seedling of the Cobbler type, 'Nittany Cobbler' was produced [cf. ibid., xiv, p. 222] which is virtually immune from degeneration diseases.

In Lancaster County, Pennsylvania, seed-bed sanitation alone is insufficient to control tobacco wildfire (*Bacterium tabacum*) [loc. cit.]; field sanitation (especially the use of fields that have become clean through crop rotation) and other measures are also necessary. In 1934, Bordeaux mixture, copper-lime dust, and calomel [mercurous chloride] all gave clean seed beds and field plots wherever the field itself was not a source of infection. *Bact. tabacum* survived the winter of 1933–4 under field conditions to an unusual degree, making control measures largely ineffective. The evidence indicates that the surviving bacteria are present not in the soil, but in the woody, incompletely decayed parts of the plant.

Smith (C. O.). **Crown gall on conifers.**— Abs. in *Phytopathology*, xxv, 9, p. 894, 1935.

After referring to records of *Pseudomonas* [*Bacterium*] *tumefaciens* on conifers [*R.A.M.*, xii, pp. 270, 405], the author states that he isolated this bacterium from *Libocedrus decurrens* [ibid., viii, p. 705; xiv, p. 289] in 1916 and successfully reproduced the symptoms of the disease by inoculation on willow (*Salix* sp.) [ibid., xi, pp. 157, 274], cherry [ibid., viii, pp. 16, 630], *Cupressus sempervirens*, and tomato [ibid., xiv, p. 565]. Galls from puncture inoculation with the organism from peach [ibid., x, pp. 40, 249] were produced in 1934–5 on a number of species of *Cupressus*, *Thuja*, *Juniperus*, *Sequoia sempervirens*, *S. gigantea* [ibid., xiv, p. 566], *Pseudotsuga taxifolia*, and *L. decurrens*. With the exception of *S. gigantea* the inoculated conifers did not respond

very actively to the bacterial infection, but the initially small, knob-shaped excrescences gradually expand and may coalesce.

Magrou (J.). **Balais de sorcière et crowngall.** [Witches' brooms and crown gall.]—*Ann. Sci. nat., Bot.*, Sér. X, xvii, 1, pp. 35–36, 2 pl., 1935.

One *Chrysanthemum frutescens* plant out of approximately 100 inoculated with the chrysanthemum strain of *Bacterium tumefaciens* showed a peculiar witches' broom formation on the inoculated branches only. From each of the tumours which developed at the points of inoculation, several small branches with very short internodes arose bearing, in addition to the secondary branches, dense tufts of dwarfed leaves [*R.A.M.*, xiv, p. 635]. Many of the other inoculated *C. frutescens* plants showed secondary tumours on the stems and leaves at some distance from the primary tumour [ibid., xiv, p. 565]; such secondary formations were exceptional on pelargoniums and were not present on tomato or *Ricinus*.

Salgues (R.). **Les tumeurs en pathologie comparée.** [Tumours in comparative pathology.]—*Rev. gén. Sci. pur. appl.*, xlvi, 13, pp. 395–405, 1935.

The writer discusses and illustrates by a large number of concrete examples the nature of the various types of gall induced in man, animals, and plants by animal and vegetable parasites. The analogies and differences between crown gall of plants (*Bacterium tumefaciens*) and human cancer are summarized and considered in the light of contemporary observations [*R.A.M.*, xiii, p. 618]. Tumours in man are also caused by various fungi, e.g., *Rhinosporidium seeberi* [ibid., xiv, p. 631] and *Enantiothamnus braulti* [ibid., xiv, p. 383]. Among the more remarkable instances of neoplasms in plants are mentioned those due to *Ustilago vriesiana* on *Eucalyptus*, *Melanopsichium austro-americanum* on *Polygonum*, and *Cintractia crus-galli* on *Panicum crus-galli*.

Cooper (E. A.) & Preston (J. F.). **Enzyme formation and polysaccharide synthesis by bacteria.**—*Bio-chem. J.*, xxix, 10, pp. 2267–2277, 1935.

The presence of peptone was experimentally shown not to be essential for polysaccharide formation from sucrose by *B.* [*Pseudomonas*] *syringae* [*R.A.M.*, xv, p. 23] and *P.* [*Bacterium*] *pruni* [ibid., xiv, p. 641], the process occurring just as freely with asparagin, and usually with *d*-alanine and *l*-leucine as sole sources of nitrogen. Other bacterial plant pathogens consistently forming polysaccharides of the fructosan type from sucrose are *P. prunicola* [ibid., xiv, p. 319], *P. mors-pruno-rum* [ibid., xiv, p. 641], *P.* [*Bact.*] *aptatum* [ibid., xi, p. 701], and *P. campestris*. A polysaccharide is occasionally yielded by *P.* [*Bact.*] *phaseoli* [ibid., xiv, p. 565], *P.* [*Bact.*] *solanacearum*, *Bacillus caroto-vorus*, *Bact. tabacum*, and *Bact. marginale* [ibid., xiv, p. 17]. Both *Bact. tumefaciens* and *B. coli*, when introduced into sucrose-peptone cultures of *Bact. pruni*, *P. syringae*, and *B. megaterium* [ibid., xiii, p. 542 and next abstracts], entirely inhibited polysaccharide formation by the latter organisms, the same result following the presence in the medium

of mannose and arabinose in the cases of *Bact. pruni*, *B. megaterium*, and *B. mesentericus*.

Details are given of the chemical constitution of the polysaccharides synthesized by the plant pathogens and methods for their preparation on a large scale described in connexion with *Bact. pruni* and *P. prunicola*.

LOMINSKI (I.). **Inactivation du bactériophage par oxydation.** [The inactivation of the bacteriophage by oxidation.]—*C.R. Soc. Biol., Paris*, cxix, 24, pp. 952–954, 1935.

Potassium permanganate was found to inactivate two bacteriophages of *Staphylococcus*, two of the colon bacillus [*Bacillus coli*], one of [*B.*] *subtilis*, 889 strain, and that of [*B.*] *megaterium* [preceding abstract], the inactivating concentration being in a direct ratio to the reducing capacity of the medium and in inverse ratio to the temperature. Hence it would appear that the inactivation of the bacteriophage by potassium permanganate is due to oxidation of the active principle [see next abstracts].

LOMINSKI (I.). **Sensibilité comparée des bactériophages et des bactéries homologues à l'oxydation.** [The comparative sensivity of bacteriophages and the homologous bacteria to oxidation.]—*C.R. Soc. Biol., Paris*, cxix, 25, pp. 1090–1092, 1935.

Further experiments in which the bacteriophages of *Staphylococcus*, the colon bacillus [*Bacillus coli*], [*B.*] *subtilis*, and [*B.*] *megaterium* were exposed, together with their homologous organisms, to concentrations of potassium permanganate ranging from 0·1 to 1 per cent. showed the former to be more sensitive than the latter to oxidation [see preceding and next abstracts]. This behaviour is in marked contrast to the resistance of the bacteriophages to most physical and chemical agencies —high pressure, radiation, antiseptics, and the like—and furnishes a means of freeing a bacterial culture from this type of contaminant. Potassium permanganate oxidation seems to act exclusively on extracellular bacteriophages and thus affords a mode of distinguishing spontaneously lysogenous cultures and ordinary ones contaminated by bacteriophage.

LOMINSKI (I.). **Inactivation du bactériophage par oxydation ; réactivation par l'acide ascorbique.** [Inactivation of the bacteriophage by oxidation; reactivation by ascorbic acid.]—*C.R. Soc. Biol., Paris*, cxix, 27, pp. 1345–1348, 1935.

The bacteriophages of *Staphylococcus*, the colon bacillus [*Bacillus coli*], [*B.*] *subtilis*, and [*B.*] *megaterium* were found to be inactivable by iodine (30 to 50 per cent. Lugol's fluid), oxygenated water (24 hours' exposure to 1 to 1·5 per cent. for young cultures, 0·2 to 0·3 per cent. for old ones), and oxygen, the action of which is favoured by a temperature of 37° C. As in the case of potassium permanganate [see preceding abstracts], these processes appear to involve the lytic principle itself and not the medium. Bacteriophages inactivated by iodine or oxygen cannot be revived either by dilution of the inactivants or by passage through cultures of the homologous bacteria, but in certain

cases the addition of ascorbic acid to the medium restored the lytic properties.

DAVIDSON (H. F.). **Some notes on Phytophthora palmivora Butl. on Tecoma smithii.**—*Ceylon J. Sci.* (formerly *Ann. R. bot. Gdns Peradeniya*), xii, 1, pp. 37–44, 2 pl., 1934. [Received December, 1935.]

The author states that isolations from a *Tecoma smithii* plant that had been killed by a collar and root rot yielded a strain of *Phytophthora palmivora*, the pathogenicity of which to this host was proved by inoculation experiments. When paired in culture on maize meal agar with a *P. palmivora* strain from *Hevea* rubber, this strain produced oospores only at the junction of the two growths, and none outside this zone, thus showing that the strain from *T. smithii* belongs to Gadd's cacao group of *P. palmivora* [*R.A.M.*, viii, p. 527]. The thick-walled, yellow or yellowish brown oogonia measured 24 to 34 μ in diameter, and the oospores 18 to 27 (mean 22·4) μ. The fungus produced on the same medium an abundance of sporangia, 39 to 79 (mean 54·7) by 22 to 40 (mean 28·9) μ, the germination of which either by means of germ-tubes or by the formation of zoospores is described in detail; the latter mode was only observed in young sporangia. The discharge of zoospores did not take place at temperatures below 20° C. or above 24°, or in the absence of air in the water, while light did not have any significant bearing on the process.

VANTERPOOL (T. C.). **Studies on browning root rot of cereals. III. Phosphorus-nitrogen relations of infested fields. IV. Effects of fertilizer amendments. V. Preliminary plant analyses.**—*Canad. J. Res.*, xiii, 4, pp. 220–250, 1 pl., 2 figs., 3 graphs, 1935.

In further investigations of the browning root rot of cereals in Saskatchewan [*R.A.M.*, xi, p. 434], the author states that while the trouble has been shown to be due primarily to the parasitism of species of *Pythium*, probably chiefly *P. arrhenomanes* [ibid., xiv, pp. 95, 494], the fact that severely diseased zones shift in location from one year to another clearly indicates a relationship between the disease and environmental conditions, and the paramount importance of these factors in determining its severity. The chemical analysis of 66 pairs of prairie soil samples, from healthy and diseased areas in central and north-central Saskatchewan, showed that in 90 per cent. of the diseased areas the available phosphorus was less than in the healthy fields, and 74 per cent. contained more nitrate nitrogen than the healthy. In 65 per cent. of the diseased areas the soil was poor in phosphorus and rich in nitrate nitrogen; 21 per cent. showed low phosphorus with low nitrate nitrogen; 7·5 per cent. showed high phosphorus with high nitrate content; and only 1·5 per cent. contained high phosphorus with low nitrate nitrogen.

Field observations showed that in diseased areas poor in available phosphorus and rich in nitrate nitrogen the average height of the wheat seedlings in June was 7·8 cm. less than that of the seedlings in the healthy areas, while just before harvest in August, the plants in the diseased areas averaged up to 20 cm. shorter, and matured from 3 to

21 days later than those in the healthy areas. In tests to determine the bearing of cultural practices on the disease, it was shown that summer fallow tends to increase considerably the nitrate nitrogen content, while having no effect on the available phosphorus. The results indicate that where the P/N ratio is relatively wide, the crop is apparently healthy, and conversely where it is narrow the crop is diseased. In places where much available phosphorus was returned to the soil by burning straw and chaff from former stacks, healthy crops developed, and this effect was usually carried over for many years. Greenhouse experiments and field observations showed further that applications of phosphate and also of farm-yard manure at the time of sowing permitted the development of normal wheat plants in diseased areas, and that the application of straw inhibits the disease to some extent, while inorganic nitrogenous fertilizers usually have no effect, and occasionally may prove detrimental. The data also suggested that applications of phosphate to fields with more than 45 parts per million available phosphorus are unlikely to give increases in yield; an increase is probable in fields with 21 to 45 p.p. million, while large increases may be expected in fields with less than 20 p.p. million of available phosphorus.

Preliminary plant analyses indicated that the total phosphorus content is lower in diseased than in healthy wheat plants, and that the former contain relatively more water-soluble nitrogen and relatively less protein nitrogen than the latter. Attention is drawn to the striking similarity of the factors affecting the severity of the browning root rot of wheat with those that influence the *Pythium* root rot of sugar-cane in Hawaii [ibid., xiv, p. 530].

The results of these studies lead the author to consider that an improper balance of the available phosphorus and nitrate nitrogen in the soil brings about an unbalanced metabolism of wheat seedlings at a critical stage in the development, thus predisposing them to fungal attack. The effect of the unbalanced nutrients on the parasitism of the pathogen requires further elucidation.

DAVIES (F. R.). **Superiority of silver nitrate over mercuric chloride for surface sterilization in the isolation of Ophiobolus graminis Sacc.**—*Canad. J. Res.*, xiii, 3, pp. 168–173, 2 figs. 1935.

In studies of the parasitism of cereal foot- and root-rotting fungi in Canada, difficulty has been experienced in isolating the take-all fungus (*Ophiobolus graminis*) [*R.A.M.*, xiv, p. 748] from infected material surface-sterilized with mercuric chloride. A brief, tabulated account is given of experiments, the results of which showed that this is chiefly due to the higher toxicity of this chemical to *O. graminis* than to *Helminthosporium* and *Fusarium* [loc. cit.], both of which develop freely from treated material. The isolation of *O. graminis* was found to be considerably easier when 1 in 100 silver nitrate was used for a period of two minutes, successful isolations ranging from 29·3 to 9·3 per cent., as against 2·8 to 1·3 with mercuric chloride. In comparative tests it was further shown that silver nitrate is less toxic to *O. graminis* than mercuric chloride, the reverse being true for *H. sativum*.

Straib (W.). **Auftreten und Verbreitung biologischer Rassen des Gelbrostes (Puccinia glumarum [Schm.] Erikss. et Henn.) im Jahre 1934.** [The occurrence and distribution of biologic forms of yellow rust (*Puccinia glumarum* [Schm.] Erikss. & Henn.) in the year 1934.]—*Arb. biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, xxi, 3, pp. 455–466, 1935.

A tabulated account is given of the writer's studies at the Brunswick branch of the Biological Institute on the prevalence of yellow rust of wheat and barley (*Puccinia glumarum*) in Germany in 1934 [*R.A.M.*, xiv, p. 294]. The material on which the work was based comprised 114 specimens, of which 110 were collected on wheat and 4 on barley from 74 localities, 59 in Germany and 15 abroad. The 169 monospore cultures thus obtained fell into 14 physiologic forms, including three new ones to which the numbers 23, 24, and 25 have been assigned. Form 23, occurring in Holland and Germany and detected in 1935 in Bulgaria, and form 24, restricted to France, were characterized by extreme severity on barley [see next abstracts], while wheat was relatively mildly attacked, the Michigan Amber variety remaining highly resistant to both forms and Chinese 166 immune from 24 but not from 23. This behaviour cannot, however, be considered to justify the retention of Eriksson's formae speciales *tritici* and *hordei* [ibid., xii, p. 272; xiii, p. 757, *et passim*], more especially in view of the existence of forms of equally slight pathogenicity to both crops which cannot be placed in either of these categories. The other new form, 25, was present only on Turkish material and was differentiated from forms 14 and 18 by its virulence to Webster, and from 13 by its inability to attack Chinese 166. The distribution of form 7 was again extended in Germany, probably owing to the widespread cultivation of varieties very susceptible to it, e.g., Carsten V, whereas the other forms mostly occurred only sporadically in the various countries supplying specimens. Form 6 was found for the first time in England (Cambridge) and form 15 in northern Sweden, but in general no striking changes were noted in the distribution of the forms of *P. glumarum* under observation.

Straib (W.). **Ueber Gelbrostanfälligkeit und -resistenz der Gerstenarten.** [On the susceptibility and resistance of Barley varieties to yellow rust.]—*Arb. biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, xxi, 3, pp. 467–481, 1935.

A tabulated account is given of the writer's investigations on the reaction of 185 barley varieties (158 summer and 27 winter) to 13 physiologic forms of yellow rust (*Puccinia glumarum*) [see preceding and next abstracts]. The test material was inoculated in the seedling stage in the greenhouse. The most virulent forms were found to be the newly isolated 23 and 24, only Ackermanns Bavaria, Heils Franken, and Heines Hanna of the German varieties being immune from the former and none from the latter, while two strains of *Hordeum vulgare pallidum* completely withstood infection not only by these two forms but by all the others used in the trials.

Straib (W.). **Infektionsversuche mit biologischen Rassen des Gelbrostes auf Gräsern.** [Inoculation experiments with biologic forms of yellow rust on grasses.]—*Arb. biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, xxi, 3, pp. 483–497, 1935.

The writer discusses and tabulates the results of his inoculation experiments on 227 grasses with three physiologic forms of *Puccinia glumarum* [see preceding abstracts], viz., 24, corresponding to f.sp. *hordei* Erikss., 2, agreeing with f.sp. *tritici* Erikss., and 18, occupying an intermediate position. No justification could be found for the retention of the formae speciales. A number of the grasses susceptible to the above-mentioned three forms, including *Bromus tectorum*, *Elymus europaeus*, *E. arenarius*, *E. sibiricus*, *Festuca* [*Glyceria*] *distans*, *Hordeum jubatum*, *H. murinum*, *Lamarkia aurea*, and *Agropyron repens*, were further tested for their reaction to 17 other forms of the rust, which for the most part attacked all indiscriminately.

Winkelmann (A.). **Warum tritt der Weizensteinbrand trotz Beizung stärker auf?** [Why is Wheat bunt more prevalent in spite of treatment?]—*Pflanzenbau*, xii, 4, pp. 149–156, 1935.

In this paper the writer discusses the reasons for the increasing prevalence of wheat bunt (*Tilletia tritici*) [*T. caries*] in Germany and elsewhere of recent years notwithstanding the general improvement both in the extent and technique of seed-grain disinfection. Various explanations of this phenomenon have been advanced. It was thought, for instance, that the extended cultivation of wheat might afford increased opportunities of soil infection, but experiments showed that, while this source of inoculum cannot be entirely disregarded, it is seldom of primary importance under German conditions. The dusting and short disinfection processes, however, were not found to confer adequate protection on the seed-grain against this form of attack. No grounds could be found, moreover, for the supposition that any appreciable amount of infection takes place between the treating and sowing of the seed-grain. Experiments are now in progress to determine whether the development of more highly pathogenic physiologic forms is responsible for the increasing virulence of the disease [*R.A.M.*, x, p. 715; cf. also ibid., xiii, p. 293].

Bodnár (J.), Terényi (A.), & Páskuj (J.). **Wirkungsmechanismus von Arsenverbindungen auf die Weizensteinbrandsporen.** [The mechanism of the action of arsenic compounds on Wheat bunt spores.]—*Biochem. Z.*, cclxxix, 5–6, pp. 448–452, 1935.

A tabulated account is given of the writers' studies in Hungary on the mode of action of some arsenic compounds on wheat bunt (*Tilletia tritici*) [*T. caries*] spores [cf. *R.A.M.*, xiii, p. 431].

Appreciable quantities of arsenic were found to be adsorbed by the spores from arsenic acid (0·97 per cent. from a 1 per cent. solution after 24 hours) and salvarsan (1·11 per cent. from a 0·32 per cent. solution), but not from arsenates, arsenites, or organic arsenic compounds; after washing the amounts left were 0·19 and 1·10 per cent., respectively, showing that the arsenic adsorption from arsenic acid

was reversible but not that from salvarsan. A definite correlation was established between adsorption and the physiological effects of the treatment, only the arsenic-containing spores failing to germinate in a calcium nitrate solution. The adsorbed arsenic remaining in the spores after washing becomes united with the enveloping albuminous substances liberated in the disinfectant solution. On moist soil, however, the arsenic is dissolved and the spores treated with arsenic acid or salvarsan germinate well, so that the action of the adsorbed arsenic is merely inhibitory. Omitting the post-immersion washing, arsenious acid, potassium arsenite, and sodium arsenite killed the bunt spores, whereas the arsenates failed to do so, indicating that arsenites are able to penetrate the interior of the spores during desiccation.

Fron (G.). **Observations au cours de la campagne 1935, sur le développement de la maladie du piétin du Blé.** [Observations during the season of 1935 on the development of foot rot of Wheat.]—*C.R. Acad. Agric. Fr.*, xxi, 23, pp. 922–923, 1 graph, 1935.

The exceptionally heavy rainfall in the Paris region from November, 1934 to April, 1935, followed by a dry spell at the time of earing, resulted in severe infection of the wheat crops by *Cercosporella herpotrichoides* [*R.A.M.*, xiv, p. 502], the primary and secondary attacks of which were clearly distinguishable. Encouraging results in the control of the disease were given by seed-grain disinfection with quinolin in dust or liquid form.

Brandenburg (E.). **Ontginningsziekte en koppergebrek.** [Reclamation disease and copper deficiency.]—*Meded. Inst. Suikerbiet., Bergen-o.-Z.*, 9, pp. 245–256, 2 figs., 1935. [French summary.]

After briefly reviewing previous investigations by himself and others on the reclamation disease of oats and other crops [*R.A.M.*, xv, p. 86], the writer describes a series of carefully controlled culture experiments with Victory oats in the Zinzadze II nutrient solution plus boric acid, manganese and zinc sulphate, and potassium sulphate, with and without the addition of copper sulphate, in concentrations of 0·05 to 0·5 mg. per l. Copper was found to be indispensable to the healthy growth of the plants, which developed the symptoms of reclamation disease in its absence and did not form normal panicles and grain unless supplied with reasonably large quantities (0·5 mg. per l.).

There is no connexion between reclamation disease and the *Pythium* infection of beets [ibid., xiv, p. 548], broad beans [*Vicia faba*], and peas, which cannot be combated by the application of copper to the soil.

Wickens (G. M.). **The objects and value of seed treatment of Maize against Diplodia.**—*Rhod. agric. J.*, xxxii, 10, pp. 721–724, 1935.

In a field test carried out in Rhodesia in 1935, maize seed, containing a large proportion of grain infected with *Diplodia* [*D. zeae* and *Gibberella saubinetii*: *R.A.M.*, xi, p. 39; xii, p. 775; xv, p. 118] and sown one week after being dusted with four [unspecified] proprietary fungicides yielded, respectively, 243·5, 227·75, 242, and 228·75 lb. per $\frac{1}{10}$ acre, as compared with 220·5 lb. in the untreated controls. Contrary to general

experience the treatments retarded and reduced germination of the seed, possibly because the latter was of very poor quality. The practice of burning trash has been found appreciably to lessen cob infection.

VAN DER PLANK (J. E.). **Some aspects of the error of estimates of wastage in stored fruit.**—*J. Pomol.*, xiii, 3, pp. 223–231, 1 graph, 1935.

The author states that in experiments concerning wastage in fruit stored for periods comparable with those encountered in commercial practice, the standard error of the estimate of wastage tends to be high, and that, in consequence, comparisons of samples are usually trustworthy only when large amounts of fruit are used, which is both expensive and tedious. An investigation [some details of which are given] was therefore made of the factors influencing the magnitude of the standard error, the results of which indicated that since the distribution of wastage among replicates is, in statistical terminology, discontinuous (the minimum difference between boxes being one wasty fruit), the percentage standard error (coefficient of variability) is greatly influenced by the amount of wastage developed in a sample. When only a small amount of wastage has developed, the percentage standard error always tends to be high, and the comparison of the wastage in different samples is difficult; as wastage increases, however, the percentage standard error decreases, at first rapidly but later more slowly, until finally it approaches a minimum, and further increases in wastage have scarcely any effect.

From the practical standpoint, in experiments in which only a small amount of wastage is expected, measures designed to increase wastage may considerably increase the efficiency of the test, while the use of more uniform fruit, its handling under more uniform conditions, and other measures devised to render the samples less heterogeneous are not effective in reducing the standard error. The latter measures should only be used in experiments in which a large amount of wastage is expected.

These conclusions have been based on the simplifying assumption that the coefficient of variability is a measure of experimental efficiency, an assumption which is not legitimate when wastage is very high (above 30 per cent.).

SMITH (R. H.) & PARKER (E. R.). **Use of zinc with oil sprays.**—*Calif. Citrogr.*, xx, 12, p. 374, 1935.

Experiments in California indicated that the zinc materials used against citrus mottle leaf [*R.A.M.*, xiv, p. 753] react with oil sprays, impairing their wetting or spreading quality and in most cases giving them a heavier oil deposit than normal. This disadvantage can be obviated, however, by using more spreader or a supplementary spreader such as blood albumin. When the mottle is not exceptionally severe, a good quality zinc oxide (which appears to be more compatible with oil sprays than most zinc materials) should be used at the rate of 1 lb. per 100 galls. of spray, or at half this concentration in mild cases, with blood albumin added at the rate of 6 oz. per 100 galls.

CONROTTE (L.). **Technique générale d'une plantation de Palmiers Elaeis au Congo Belge.** [A general technique for an Oil Palm plantation in the Belgian Congo.]—*Bull. agric. Congo belge*, xxvi, 1, pp. 46–88, 8 figs., 1935.

In these full, practical notes on the culture of the oil palm (*Elaeis*) [*guineënsis*] in the Belgian Congo brief reference is made to the symptoms and control of various diseases of this host. These include bud rot; crown disease [*R.A.M.*, xiv, p. 357]; unspecified fungal fruit diseases; an obscure condition in which the fruits dry up while still attached to the tree; a disease, apparently of bacterial origin, in which though the trees remain apparently healthy the fruits become sticky; and rotting at the base of the trunk of old palms occasioned by various unspecified fungi [? *Ganoderma applanatum*: ibid., xii, p. 80], causing the death and falling of the affected trees.

BITANCOURT (A.). **A Hemileia e o Brasil.** [*Hemileia* and Brazil.]—*Rev. Inst. Café Estac. S. Paulo*, x, 105, pp. 2106–2109, 1 fig., 1935.

An outline is given of the history and distribution of the coffee leaf rust (*Hemileia vastatrix*), the absence of which from Brazil is regarded as a contributory cause of its relatively immense production (averaging 12,789,000 sacks per annum during 1911–25), as compared with other coffee-growing countries (4,367,000 sacks), from the eighties of the last century onwards.

STEYAERT (R. L.). **Étude du shedding en rapport avec la 'frisolée' du Cotonnier.** [A study of shedding in relation to 'frisolée' of Cotton.]—*Bull. agric. Congo belge*, xxvi, 1, pp. 3–45, 12 figs., 24 graphs, 1935.

A full account is given of the author's detailed study of the shedding of cotton floral buds and bolls in the Belgian Congo in relation to physiological and meteorological factors and the disorder termed 'frisolée'. The results obtained [which are tabulated] showed that the intensity of the shedding is correlated with the stage of growth reached by the organs concerned, and that the dropping of the floral buds is directly affected by drought, that of the bolls being due to the indirect action of soil moisture on the osmotic strength of the cell sap.

'Frisolée' becomes most intense when shedding reaches a maximum. The first symptoms appear when boll formation begins and take the form of a late season tomosis [*R.A.M.*, iv, p. 167], the leaves as soon as they open showing perforations in the blade or even lacerations completely separating the veins. If the whole leaf surface is affected the leaf has a flattened appearance, but if only part is attacked the resulting growth inequalities produce malformations and distortions. The internodes of the boll-bearing branches are shortened and axillary buds are formed. The top parts of the plants either produce no bolls or misshapen ones. Plants in a strongly vegetative phase are the most susceptible. Control would appear to consist in the selection of resistant lines.

VASUDEVA (R. S.). **Studies on the root-rot disease of Cotton in the Punjab.**—*Indian J. agric. Sci.*, v, 4, pp. 496–512, 2 pl., 2 graphs, 1935.

Root rot of American and indigenous cotton is stated to be of long standing in the Punjab, where the annual losses caused by it vary considerably from region to region (from about 1·15 per cent. in the Sargodha Colony up to 60 per cent. in the zamindars' area), and are conservatively estimated to average approximately 2·5 per cent. of the crop for the whole State, entailing a loss of Rs 1,575,000 [£118,125] per annum. The most striking symptom of the disease is the sudden and complete wilting of affected plants, recovery being very rare and only occurring in cool nights, in wet weather, or in irrigated fields; the whole of the root system, with the exception of the tap and a few lateral roots, becomes decayed and detached, so that the plants may be easily pulled out of the ground. These features, as well as the facts that in recently wilted plants the root is slightly moist and sticky to the touch at the tip and shows considerable shredding of the bark and yellowing of the exposed woody tissues, distinguish this rot from the cotton root rot in the Gujerat [*R.A.M.*, xiv, p. 359], with which, however, it has many points of similarity. In badly affected plants the wood may become brown or black and all the root tissues broken down into shreds. Sclerotia have been observed only rarely. The disease first appears in June, when the cotton plants are about six weeks old, reaches a maximum percentage incidence within a fortnight, and continues so throughout July; in August the mortality rate gradually declines, and falls almost to zero by the end of September.

Isolations from diseased root material yielded two species of *Rhizoctonia*, one of which was identified as a strain of the *R.* [*Corticium*] *solani* group [ibid., x, p. 661; xiv, p. 629], and the other is provisionally considered to be a strain or saltant of *R. bataticola* [*Macrophomina phaseoli*: ibid., x, p. 660; xiv, p. 359], two strains of *Fusarium solani*, either alone or associated with *Rhizoctonia* and occasionally *Alternaria* sp. and *Helminthosporium* sp.

Preliminary pot infection experiments, in which the inoculum was placed in contact with the roots, gave no definite signs of root rot except that some of the roots were affected by either of the species of *Rhizoctonia*. In a second series the soil was washed from the roots of plants six to ten weeks old and the plants repotted in sterile soil. After seven to ten days the top layer of soil was removed, the inoculum added, and the top soil replaced. Within five to seven days, 7 out of 10 plants showed infection by *C. solani*, 2 out of 8 by *M. phaseoli* [loc. cit. and cf. ibid., xiv, p. 233], and 0 out of 17 by the two strains of *F. solani*. In a third series the washed plants were repotted in infected soil, the corresponding results being 9 out of 9, 5 out of 8, and 0 out of 12. Further experiments in which the soil was washed away to a depth of 4 in., the inoculum and then sterile soil being added, gave infection by *C. solani* varying from 8·3 to 78·6 per cent. and by *M. phaseoli* of 15 to 100 per cent. Other experiments [which are described in detail], both by planting seed in pots containing sterilized infected soil and in the field by washing away the soil from the roots with a hose before

adding the inoculum, gave positive results, *C. solani* infecting 50 out of 108 plants inoculated in the field, and *M. phaseoli* 24 out of 145. On the basis of these results the author attributes the disease to these two fungi.

Arndt (C. H.). **The etiology of damping off of Cotton seedlings.**—Abs. in *Phytopathology*, xxv, 10, pp. 968–969, 1935.

Glomerella gossypii [*R.A.M.*, xiv, p. 629] was responsible for heavy losses among cotton seedlings in 1934 in South Carolina, where greenhouse studies showed that it may cause damping-off at soil temperatures up to 30° C. *Fusarium* spp., though representing 15 to 75 per cent. of the organisms isolated from diseased hypocotyls, do not appear to be the cause of appreciable losses in the stands, and the same is true of *Rhizoctonia* [*Corticium solani*: see preceding abstract] which was found on less than 10 per cent. of the infected material examined during the last ten years. In one field *Pythium ultimum* [ibid., xiv, p. 383] was observed to be a common agent of reduced germination and impoverished stand.

Young (V. H.), Ware (J. O.), & Pope (O. A.). **Control of potash hunger and Fusarium wilt in Cotton.**—Abs. in *Phytopathology*, xxv, 10, p. 969, 1935.

Of the 18 cotton varieties resistant to wilt (*Fusarium*) [*vasinfectum*] tested in 1934 in western Arkansas, five, viz., Clevewilt 33-6, Dixie 14, Rhyne's Clevewilt 33–10, Coker's Clevewilt 3, and Rhyne's Clevewilt, showed 4 to 8 per cent. infection compared with 29 to 44 per cent. for the five most susceptible, namely, Startex, Acala 1114, Super Cleveland, Trice, 304, and Half and Half [*R.A.M.*, xiii, p. 698; xiv, pp. 221, 629, and next abstract]. Among the 36 varieties studied in the eastern part of the State, the incidence of infection ranged from 1 per cent. in Rhyne's Clevewilt to 49 per cent. in Half and Half, the susceptible varieties consistently falling into the low-yielding group.

The results of five years' experiments indicate that the control of potash hunger or 'rust' [ibid., xiv, p. 629] by the application of potash-containing fertilizers leads to a marked decrease, in central and eastern Arkansas, in the severity of wilt attacks. In 1933 and 1934 the use of a resistant variety, Rowden 2088, combined with potash applications, gave the best control of 'rust' and wilt.

Neal (D. C.). **Wilt-resistant Cottons adapted to the Gulf Coastal Plains** —Abs. in *Phytopathology*, xxv, 10, p. 974, 1935.

Of the cotton varieties resistant to wilt [*Fusarium vasinfectum*: cf. preceding abstract] those best adapted to cultivation in the southern part of Mississippi were found in trials from 1932 to 1934 to be selections of Dixie Triumph, Miller, and D. & P. L., which have given yields exceeding one bale per acre under conditions of severe infestation. The fibre of several of the selections is also of superior quality and correct length. Selections of Acala, Cook, Toole, Nucala, Clevewilt, Super Seven, Lightning Express, and Mexican Big Boll showed some degree of resistance to wilt in these tests but are less suitable for local conditions than the foregoing.

Miles (L. E.). **The Verticillium wilt disease of Cotton.**—Abs. in *Phytopathology*, xxv, 10, pp. 972–973, 1935.

Cotton wilt (*Verticillium*) [*albo-atrum*: *R.A.M.*, xiii, p. 632], first reported from Mississippi in 1930, has been found in nine counties of the State and in Tennessee, Arkansas, California, Oklahoma, and Virginia, as well as in Greece. In July, 1933, field inoculations were made with strains of the fungus from (1) cotton in Mississippi, (2) cotton in California, and (3) Irish potatoes in Canada. The Mississippi strain produced severe infection of all the plants in a fortnight, that from California caused relatively mild symptoms on 16 per cent., while the Canadian strain gave negative results. The mottling and blotching characteristic of the Mississippi strain did not develop in plants infected by the Californian form. Neither strain proved pathogenic during hot, dry weather in August. On potted greenhouse tomatoes inoculated with the same strains in the spring of 1933, the Canadian caused much more severe and earlier symptoms than either of the others, but the latter were much more virulent than the Canadian form on eggplants, snapdragons [*Antirrhinum majus*], beets, and California poppy [*Eschscholtzia californica*]. The Californian strain differs from the others in producing no microsclerotia in culture.

Steyaert (R. L.). **Un ennemi naturel du Stephanoderes, le Beauveria bassiana (Bals.) Vuill. Étude des facteurs ambiants régissant sa pullulation.** [A natural enemy of *Stephanoderes*, *Beauveria bassiana* (Bals.) Vuill. Study of the environmental conditions which govern its spread.]—*Publ. Inst. nat. Étude agron. Congo Belge* 2 (*Sér. sci.*), Brussels, 46 pp., 2 figs., 14 graphs., 1935.

A tabulated account is given of field and laboratory experiments to determine the environmental conditions which favour the epidemic spread of *Beauveria bassiana* on the coffee berry borer (*Stephanoderes hampei*) [*R.A.M.*, xiv, pp. 224, 629] in coffee plantations in the Belgian Congo. Field observations indicated that the greater percentage mortality among insects living on green berries is due to their longer exposure to infection with the fungus while seeking a berry of sufficient maturity in which to lay their eggs, as once ensconced inside the berry the insects are relatively well protected from infection. Dull weather also favours the spread of the disease, as the insects shun direct sunlight and come out of the galleries only in the evening or during cloudy, sunless periods. The optimum humidity for infection appeared to be around 79 per cent. A brief discussion is given of the bearing of these findings on the possibility of using *B. bassiana* for the biological control of the coffee berry borer.

Durant (A. J.) & Tucker (C. M.). **Aspergillosis of wild Turkeys reared in captivity.**—*J. Amer. vet. med. Ass.*, lxxxvi, 6, pp. 781–784, 2 figs., 1 graph, 1935.

Aspergillus fumigatus was determined as the agent of a serious disease involving the majority of 785 wild turkey poults reared in captivity in Missouri in 1934 [cf. *R.A.M.*, xiii, p. 510; xv, p. 19], the fungus being isolated from congested lung tissue and grown on acidified

potato-dextrose agar. Samples of the commercial mash feed of cod-liver oil and fish meal proved to be heavily infested, and the evidence obtained by feeding experiments with infected and sterilized material definitely implicated the former as the source of the trouble.

Szathmáry (S.). **Unbekannte Varietät des Kaufmann-Wolfschen Epidermophyton.** [An unknown variety of the Kaufmann-Wolf *Epidermophyton*.]—*Derm. Wschr.*, ci, 43, pp. 1327–1329; 4 figs., 1935.

Both in the site of infection on the back of the hand and in the furcate colonies on maltose-peptone agar a strain of *Epidermophyton* isolated from a 20-year-old carpenter's apprentice in Hungary differed from the normal type of *E.* Kaufmann-Wolf [*R.A.M.*, xiv, pp. 104, 759]. However, the typical cerebriform aspects of the subcultures, the results of animal inoculations, and the morphological characters of the fungus are considered to identify it as a hitherto unknown variant of the species in question.

Dey (N. C.) & Maplestone (P. A.). **Ringworm of the scalp in India.**—*Indian med. Gaz.*, lxx, 10, pp. 541–544, 1 col. pl., 4 figs., 1935.

Of 53 consecutive cases of tinea of the scalp examined during the last three years at the Calcutta School of Tropical Medicine, 20 were found to be due to *Trichophyton violaceum* [*R.A.M.*, xiii, p. 511; xiv, pp. 35, 102], here recorded for the first time in India, while the rest, with the exception of two cases of favus, were caused by *Microsporon audouini* [ibid., xiv, p. 695].

Spores of the former fungus, 3 to 5 μ in diameter, were distributed axially along the infected hairs, to which a characteristic beaded appearance is imparted, quite distinct from the mosaic aspect of material attacked by the small-spored *M. audouini*. The fungus was cultured from infected hair, epidermal scales, and pus from follicles on the scalp, the best growth occurring on Sabouraud's maltose-peptone agar and Pollacci's medium. With each subculture the typical violet coloration gradually fades until the colonies appear either uniformly or patchily cream-coloured; occasionally the primary cultures themselves are cream-coloured. On a synthetic nutrient medium the normal violet colour of the colonies was replaced by pink. Modifications in the type of growth of *T. violaceum* were also observed in the course of subculturing. The long, slender mycelium contained spore-like structures, while in well-slide preparations both terminal and intercalary chlamydospores are found, the former being oval or round, 16 to 18 μ in diameter, and old mycelia develop irregular arthrospores with unilateral swellings. Positive results were given by inoculations on two monkeys.

Considered both from the cultural and morphological standpoints, *T. violaceum* should preferably be transferred to *Achorion*, to which it approximates in its faviform type of growth (reproduced in the lesions on the monkey) and in the formation of chlamydospores and arthrospores, and it is therefore proposed to rename it *A. violaceum*, the following being synonyms: *T. album* Sabouraud [ibid., xiii, p. 513], *Ectotrichophyton album* Castellani & Chalmers, *T. glabrum* Sabouraud

[ibid., x, p. 458], *T.* (*indicum*) *violaceum* Acton & McGuire, and *T.* (*decalvans*) *violaceum* Castellani.

Crosti (A.). **Osservazioni e ricerche sui rapporti biologici e patogeni che intercorrono tra Trichophyton violaceum e glabrum.** [Observations and researches on the biological and pathogenic relationships existing between *Trichophyton violaceum* and *T. glabrum*.]—*Boll. Sez. reg.* (*Suppl. G. ital. Derm. Sif.*), xiv, 4, p. 351, 1935.

In Umbria, where *Trichophyton violaceum* is stated to be endemic and responsible for 85 per cent. of the cases of scalp ringworm, *T. glabrum* has been isolated six times during the last four years [*R.A.M.*, xiv, p. 35 and preceding abstract]. The two fungi cause exactly the same clinical manifestations. *T. glabrum* develops more rapidly than *T. violaceum* and forms well-defined radial colonies in culture. Pleomorphism in the accepted sense was found to be quite exceptional in both organisms, *T. glabrum* normally being entirely without chromogenic properties on any of the usual substrata, though three strains assumed a temporary purple coloration in Sabouraud's medium with salts of magnesium, which also accentuated the pigmentation in *T. violaceum*, but this was lost in liquid media or Sabouraud's at 37° C. The purple pigment is readily extractable with benzol. Neither fungus exercises any appreciable pathogenic effect on animals.

Sauthof (G.). **Über Zusätze zu Nährboden, die das Wachstum der Pilze nicht stören, das von Bakterien aber hemmen.** [On admixtures with nutrient media which inhibit bacterial growth without impeding that of fungi.]—*Derm. Wschr.*, ci, 40, pp. 1245–1247, 1935.

The admixture of 10 per cent. of a 1·5 per cent. yatren solution with Sabouraud's or Grütz's nutrient agar was found to inhibit bacterial contamination without impeding the development of *Trichophyton gypseum* [*R.A.M.*, xiv, p. 510].

Davidson (A. M.) & Gregory (P. H.). **The so-called mosaic fungus as an intercellular deposit of cholesterol crystals.**—*J. Amer. med. Ass.*, cv, 16, pp. 1262–1264, 4 figs., 1935.

The irregular, discrete, branching threads of the so-called 'mosaic fungus', a frequent concomitant of ringworm agents [*Trichophyton* spp.] in scrapings from the feet, was found in the course of four years' routine laboratory work at Winnipeg, Canada, to consist mainly, if not entirely, of crystals of cholesterol, soluble in xylene and other fat solvents. It is therefore proposed to refer to the disease as the 'cholesterol mosaic' pending further studies on its nature.

Negroni (P.). **Variation du type R. de Mycotorula albicans.** [Variation of the R type in *Mycotorula albicans*.]—*C.R. Soc. Biol., Paris*, cxx, 36, p. 815, 1935.

In the course of subculturing a monospore culture of *Mycotorula* [*Candida*] *albicans* [*R.A.M.*, xv, p. 20] in unfavourable media (rabbit serum anti-*C. albicans*, bouillon with glucose and phenol or formol at 0·5 to 1 and 2 per cent., and an alkaline bouillon, with P_H 8 to 9, at

40° C.), the writer observed the development of aberrant colonies approximating to the R [rough] type in bacterial cultures. They were characterized by dentate margins and radial furrows and were only half the size of the S [smooth] colonies, besides being devoid of pathogenic action on rabbits. Unlike the normal smooth cultures, moreover, the rough ones form no hyphae in potato water, and suspensions in physiologic water agglutinate spontaneously with a 2 per cent. solution of trypaflavin and curdle into fine flakes with specific serum. The biologic properties of the rough cultures are identical with those of the smooth but less pronounced, and the cells of both types are capsulate.

Bernhardt (R.), Zalewski (G.), & Burawski (J.). **Generalisierte Torulose (europäische Blastomykose).** [Generalized torulosis (European blastomycosis).]—*Arch. Derm. Syph., Berl.*, clxxiii, 1, pp. 78–90, 5 figs., 1935.

A full account is given of a case of generalized torulosis or European blastomycosis in a 55-year-old agricultural worker at a Warsaw hospital. The case, to which some importance is attached in view of the rarity of the disease in Poland, is discussed chiefly under its clinical aspects. The causal organism was found to be a *Torula* [? *Cryptococcus* or *Torulopsis*: see next abstract] closely allied to Urbach's and Zach's strains I b and III b, positive results with which were given by inoculation experiments on laboratory animals, the cultures undergoing no loss of viability in the course of a year.

Benham (Rhoda W.). **Cryptococci—their identification by morphology and by serology.**—*J. infect. Dis.*, lvii, 3, pp. 255–274, 13 figs., 1935.

The identification of species of *Cryptococcus* [*R.A.M.*, xv, p. 96] necessitates observations not only on their morphology and cultural aspects but also on their serological and biological reactions, while virulent strains can be recognized only by animal inoculations. The species parasitic on man may be divided into four groups on the basis of colony characters and agglutination relationships, viz., (1) comprising at least three apparently non-pathogenic species, *C. glabratus*, *C. ovoideus*, and *C. aggregatus*; (2) probably composed of the single species herein described for the first time as *C. mucorugosus*, with corrugated, pitted colonies and three types of cells measuring, respectively, 6 to 7, 5 to 6, and 4 to 5 by 2·5 to 3 μ, forming acid in dextrose, levulose, and maltose, not obviously pathogenic; (3) *C. hominis* [or *Torulopsis neoformans*: loc. cit.], comprising both highly virulent and non-pathogenic strains and two varieties and including within its range *Torula histolytica* and *Saccharomyces tumefaciens*; and (4) embracing a number of pink- or red-pigmented, non-pathogenic strains, bearing a close resemblance to *T. pulcherrima* [ibid., xiv, p. 523] isolated from fruit, especially grapes, for which the name of *C. pulcherrimus* is proposed.

Mazzanti (C.). **Blastomicosi cutanea. (Osservazioni cliniche istologiche e parassitologiche.)** [Cutaneous blastomycosis. Clinical, histological, and parasitological observations.]—*Boll. Sez. reg. (Suppl. G. ital. Derm. Sif.)*, xiv, 4, pp. 351–352, 1935.

A fungus isolated from granulomatous inguinal lesions in a 34-year-

old male patient at Florence was characterized by minute, circular or clavate, double-contoured elements, reacting positively to nuclear stains, and was identified by Profs. Pollacci and Redaelli as *Gilchristia dermatitidis* [*R.A.M.*, xiv, p. 582].

FARNETI (F.). **Ricerche sperimentali sulla azione patogena dell' Aspergillus niger.** [Experimental studies on the pathogenic action of *Aspergillus niger*.]—*Pathologica*, xxvii, 528, pp. 670–679, 1935. [German and English summaries.]

A detailed account is given of the writer's inoculation experiments on rabbits with suspensions of *Aspergillus niger* [*R.A.M.*, xv, p. 20] in doses of 2 to 4 c.c., from which it appears that intraperitoneal injections at the maximum rate consistently induce fatal general intoxication without acute or chronic inflammation in the peritoneal cavity. At lower concentrations the fungus produced no specific pathogenic effects when inoculated either through intraperitoneal, intravenous, or intraparenchymatous channels.

DUDLEY (H. W.). **Ergometrine.**—*Proc. roy. Soc.*, Ser. B, cxviii, 810, pp. 478–484, 1 pl., 1935.

A precise chemical description is given of the alkaloid ergometrine ($C_{19}H_{23}O_2N_3$) isolated from ergot [*Claviceps purpurea*] with which ergobasine and, in all probability, ergotocin are stated to be identical [*R.A.M.*, xv, p. 22].

[Evidence for the identity of ergotocin with ergometrine is also given by the writer in *J. Amer. chem. Soc.*, lvii, 10, pp. 2009–2110, 1935.]

MATTICK (A. T. R.), HISCOX (E. R.), & DAVIS (J. G.). **Biennial reviews of the progress of dairy science: Section B. Bacteriology and mycology applied to dairying.**—*J. Dairy Res.*, vi, 3, pp. 422–453, 1935.

In this survey of the more important contemporary literature on various aspects of dairy science most of the references of mycological interest are comprised in the section dealing with butter [cf. *R.A.M.*, xiv, p. 761]. The following items, in addition to those already noticed in this *Review*, may be mentioned. Orla-Jensen and Otte (*Maelkeritidende* [Odense, Denmark], 21, p. 411, 1933) advocate storage temperatures not exceeding −3·5° to −7·5° C. for the control of fungal spoilage in butter. The chief sources of mould inoculum are wooden utensils, such as churns and tubs. Not only does the open structure of the wood afford protection to the spores, but according to data obtained by Mme Shunina in 1930 at the Vologda Dairy Institute, U.S.S.R. (*Biol. Abstr.*, viii, p. 164, 1934), the substance itself exerts a stimulatory action on mould growth. Arup and Gilmour (*J. Dep. Agric. Irish Free St.*, xxxii, p. 257, 1933) found little correlation between keeping quality as indicated by flavour scores and the yeast, mould, and bacterial counts of butter. The incidence of moulds was reduced at −12°.

Costa (A. S.) & Krug (H. P.). **Eine durch Ceratostomella hervorgerufene Welkekrankheit der Crotalaria juncea in Brasilien.** [A wilt disease of *Crotalaria juncea* in Brazil caused by *Ceratostomella*.]—*Phytopath. Z.*, viii, 5, pp. 507–513, 8 figs., 1935.

A hitherto undescribed wilt disease of *Crotalaria juncea* in Brazil is characterized by dark, elongated or oval, isolated or confluent lesions proceeding from the stem base upwards and sometimes forming fairly broad stripes, which are reproduced in the xylem and medullary parenchyma. The upper part of the stem becomes limp and commences to droop, while at the same time the lower leaves are shed and the upper ones shrivel. The fungus isolated from diseased material produced both in nature and in culture perithecia with a diameter of 112 to 240 μ, the neck measuring 224 to 832 μ in length and 80 to 128 μ in diameter at the base, ascospores (found only in the medulla of the plants) 3·5 to 5·6 by 3·2 to 4·8 μ, and two types of conidia, namely, hyaline (35 to 108 by 4 to 8 μ) and brown (11·5 to 16 by 9 to 12 μ). These dimensions agree approximately with those of *Ceratostomella fimbriata* [*R.A.M.*, xiv, p. 274], to which the fungus is tentatively referred. Inoculation experiments by means of soil infestation, insertion of culture material through cuts in the stem base, and spraying a spore suspension of the fungus on the plants gave positive results. The organism probably lives in the soil and infects the plants chiefly through the roots. In young plants (20 days old) the incubation period was found to be only four days, increasing to 15 to 20 in older ones (four months). The conidia and ascospores serving as inoculum for secondary infections are produced on the black stripes near soil level. The large numbers of brown conidia in the dying plants probably act as important sources of infection either in the plant refuse or in the soil.

Jenkins (Anna E.) & Wehmeyer (L.). **Transfer of Diaporthe umbrina to the genus Cryptosporella.**—*Phytopathology*, xxv, 9, pp. 886–889, 1 fig., 1935.

When the agent of brown canker of rose was designated *Diaporthe umbrina* [*R.A.M.*, xiv, p. 498] in 1918 (*J. agric. Res.*, xv, p. 593), there was reason to anticipate the development of its pseudoseptate into septate ascospores. This expectation, however, was not realized, and hence it has been decided to transfer the fungus to *Cryptosporella*, a genus established by Shear (*Phytopathology*, i, p. 116, 1911) for an allied fungus, *C. viticola* [*R.A.M.*, xi, p. 790], with unicellular ascospores and a *Phomopsis* conidial stage, as *C. umbrina* (Jenkins) n.comb. [ibid., xiii, p. 270]. A comparison of a hitherto undetermined *Diaporthe* occurring on rose petals in Louisiana with *C. umbrina* revealed a very close relationship between the two species, the chief difference being, apart from the septation of the ascospores, the production by the former of both α and β (*Phomopsis*) conidia, the α conidia being practically indistinguishable from those of the *Cryptosporella*, β conidia not being formed by this species; on maize meal agar the perfect stage developed and the organism is now recognized as *D. eres* [loc. cit.]. Several other collections of *Phomopsis* from rose cankers showed α and β conidia but no perfect stage and are probably referable to *D. eres*.

McWhorter (F. P.). **The properties and interpretation of Tulip-breaking viruses.**—Abs. in *Phytopathology*, xxv, 9, p. 898, 1935.

The theory that tulip breaking [*R.A.M.*, xiii, p. 446] results from the interaction of two antithetic viruses, one tending to add colour to the flowers and the other to remove it, has been substantiated by synthesis of normal breaks by the inoculation of unbroken tulips with virus mixtures. The colour-removing virus was found to be dominant. A juice inoculum of 10 parts of colour virus added to 1 part of colour-removing virus resulted in the synthesis in a group of test plants of numerous normal breaks comparable to commercial Rembrandts in appearance. The two viruses were inseparable on the basis of physical properties, which include thermal death point between 65° and 70° C., virulence in dilutions up to 1 in 100,000, resistance to desiccation of the leaves for 11 days, resistance to alcohol, and ready transmissibility by hypodermic injections. The tulip viruses are stated to be very closely allied to those often found in bulb-perpetuated lilies.

Tompkins (C. M.), Tucker (C. M.), & Clarke (A. E.). **Root rot of Aster caused by Phytophthora cryptogea.**—Abs. in *Phytopathology*, xxv, 9, p. 895, 1935.

A root disease of China asters (*Callistephus chinensis*), caused by *Phytophthora cryptogea* [*R.A.M.*, xiii, p. 516; cf. also xiv, p. 559], was observed at San Francisco and elsewhere in California in 1934. Infection is favoured by low-lying situations and poor drainage. The fungus enters the plants near the base of the tap-root and ascends to the base of the petioles, producing a blackish-brown discoloration of the tissues; owing to the entire loss of turgidity in the leaves the aerial parts collapse and premature death ensues. Inoculation and reisolation tests on young, healthy plants (Late Branching Mary Semple) in the greenhouse at 18° C. with pure cultures of the fungus gave positive results. In further tests complete susceptibility to *P. cryptogea* was shown by 45 varieties, including types resistant to *Fusarium* wilt [ibid., xv, p. 98]. On oatmeal agar a white, cottony mycelium is produced, with occasional clusters of small, hyaline, thin-walled vesicles, but no sporangia or oogonia. On Petri's solution or a non-sterile soil suspension, however, the hyphae develop long-ovate to obpiriform, non-papillate sporangia, 33 by 17·5 μ, with a small, refringent, thickened region at the apex, but no oogonia. The growth of the fungus is most profuse at 25° to 28° and ceases at 35°. This is believed to be the first definite record of *P. cryptogea* in the United States.

Troy (Zeliaette). **Aster yellows and its control.**—*Flor. Exch.*, lxxxv, 16, pp. 13, 17, 3 figs., 1935.

This article is a résumé in popular terms of Kunkel's investigations into aster yellows [*R.A.M.*, x, p. 734; xii, p. 136], carried out at the Boyce Thompson Institute for Plant Research, and is issued as Professional Paper, Vol. 1, No. 28 of that Institute.

Dana (B. F.) & McWhorter (F. P.). **An outbreak of curly top on Pansy.**—Abs. in *Phytopathology*, xxv, 9, p. 894, 1935.

A serious outbreak of curly top on the pansy [*Viola tricolor*], charac-

terized by dwarfing and rosetting of the shoots and diminution of flower size and seed production, affected an important seed industry in Oregon in 1934, 20 per cent. of the plants in a five-acre field showing severe injury on 6th July. A blue-flowered foreign strain showed extreme susceptibility with 80 per cent. heavily damaged plants, but otherwise no differences in varietal reaction were observed. Many of the diseased plants died prematurely. All the plants examined on 6th July bore large numbers of adults and nymphs of the beet leafhopper, *Eutettix tenella*, indicating, in conjunction with the severity of the symptoms on pansy, that the latter is a favourable host both for the insect and for the curly top virus [*R.A.M.*, xiv, p. 813]. Infection was not found to be transmitted by the seed.

BLUMER (S.). **Infektionsversuche mit Erysiphe hyperici (Wallr.) Fr.** [Inoculation experiments with *Erysiphe hyperici* (Wallr.) Fr.]—*Mitt. naturf. Ges. Bern, 1934*, pp. xxxi–xxxiii, 1935.

Most of the Swiss species of *Hypericum* are liable to infection by the conidial (*Oidium*) stage of *Erysiphe hyperici* [*E. polygoni* sensu Salmon], the perithecia of which are relatively infrequent. In a series of tests in 1933 and 1934 on 27 species belonging to five sections of the genus, all but two (*H. olympicum* and *H. erectum*) of the 16 comprised in *Euhypericum* were more or less susceptible, including *H. humifusum*, which Hammarlund [in Sweden] found immune in 1925 [*R.A.M.*, iv, p. 431]. *H. olympicum* was observed showing spontaneous infection next to diseased *H. montanum* in the Berne Botanic Garden in 1919, so that its resistance in these trials cannot be regarded as absolute. With one doubtful exception, none of the species in the sections *Norysca*, *Roscyna*, and *Myriandra* contracted infection, and only two (again with one questionable exception) in *Androsaemum*, namely, *H. calycinum* and *H. elatum*. *E. hyperici* would thus appear to represent a single physiologic form attacking primarily the *Euhypericum* section and only occasionally found on members of other groups.

TAUBENHAUS (J. J.). **On a black crown rot of greenhouse Snapdragons caused by Myrothecium roridum Tode.**—Abs. in *Phytopathology*, xxv, 10, pp. 969–970, 1935.

Myrothecium roridum [*R.A.M.*, xiv, p. 428] was isolated from greenhouse antirrhinums affected by a destructive crown rot killing over 90 per cent. of the plants at Waco, Texas, in 1933 and 1934. The diseased crowns are water-soaked at first, then become shrunken, dry, and covered with a thin, white mycelium and numerous black sporodochia; finally, the epidermis and cambium rupture and become shredded. Inoculation experiments with the fungus on normal plants gave positive results.

GRANDFIELD (C. O.), LEFEBVRE (C. L.), & METZGER (W. H.). **Relation between fallowing and the damping-off of Alfalfa seedlings.**—*J. Amer. Soc. Agron.*, xxvii, 10, pp. 800–806, 2 figs., 1 graph, 1935.

During an experiment from 1930 to 1935 in Kansas, lucerne seed planted in soils fallowed for periods of one to five years produced less

vigorous seedlings and poorer stands than that sown in soils previously under a rotation of sorghum, maize, wheat, oats, and lucerne. Of the fungi isolated from the roots of affected plants, comprising *Fusarium*, *Helminthosporium*, *Trichoderma*, and *Pythium* spp., only the last-named proved to be pathogenic, the heaviest damage being observed in soils with a hydrogen-ion concentration of P_H 6 to 8 [cf. *R.A.M.*, xiv, p. 588].

GOIDÀNICH (G.). **Osservazioni sopra una malattia del Trifoglio rara in Italia: l'antracnosi da 'Kabatiella caulivora (Kirchn.) Karak'.** [Observations on a Clover disease rare in Italy: anthracnose caused by *Kabatiella caulivora* (Kirchn.) Karak.]—*R.C. Accad. Lincei*, xxii, 7–8, pp. 354–358, 1 fig., 1935.

The writer describes the symptoms of clover anthracnose (*Kabatiella caulivora*) [*R.A.M.*, xiv, p. 241] and discusses the morphology and taxonomy of the causal organism on the basis of recent studies on material of *Trifolium pratense* from Verona. From a cursory perusal of the Italian phytopathological literature this would seem to be the first record of *K. caulivora* in the country, but it is evident from Voglino's description (*Ann. Accad. Agric. Torino*, li, p. 221, 1908) of the disease ascribed by him to *Gloeosporium trifolii* [*R.A.M.*, xi, pp. 100, 147] that *K. caulivora* (*G. caulivorum*) was actually implicated. Associated with the anthracnose fungus in the Verona plants was *Polyspora lini*, a parasite of flax [ibid., iv, p. 129; xii, p. 580], but it was impossible to trace a definite relationship between the two organisms.

MILLER (P. R.). **Fruit and vegetable losses in market and kitchen garden caused by plant diseases.**—*Plant Dis. Reptr Suppl.* 88, 25 pp., 4 figs., 1 diag., 1 graph, 1 map, 1935. [Mimeographed.]

A tabulated account is given of the data resulting from an inquiry conducted in Tennessee during 1932–34 into the nature and extent of the losses due to disease occurring among fruit and vegetable stocks in the hands of the distributors and consumers [cf. *R.A.M.*, xiv, p. 780]. The investigation necessitated the co-operation of a large group of interested persons willing to keep accurate and complete records of purchases and to call attention to all spoiled produce; and the resultant data were evaluated by systematic and uniform methods. The percentage losses sustained by each fruit and vegetable are specified and the causes indicated but no computation is made of the total loss.

In a discussion of the results of the survey the writer comments on the ignorance of most of the dealers interviewed of even the most elementary principles of biology, this lack of knowledge being indirectly responsible for a considerable proportion of the losses sustained both by distributors and consumers. For instance, a shipment of oranges arriving in fair condition was unloaded by the shovel method and held for ten days in common storage on account of over-stocking; the injuries received in unloading together with the ubiquitous blue mould (*Penicillium*) [*italicum*: ibid., xiv, p. 754] spores in the atmosphere caused a loss of 500 out of 600 bushels.

KELSALL (A.). **The iron sulphate and lime-sulphur mixture as a spray.**—*Canad. Chem. Metall.*, xix, 9, p. 239, 1935.

A mixture of iron sulphate (10 or 6 lb.), lime-sulphur (2½ or 1½ galls.), and calcium arsenate (4 to 5 or 3 to 4 lb.) per 100 galls. water has been extensively used for the last few years in the Maritime Provinces of Canada with very satisfactory results in the control of orchard pests and diseases [chiefly apple scab, *Venturia inaequalis*: *R.A.M.*, xiii, pp. 310, 682]. The best of the spreaders so far tested for incorporation with this mixture is lignin pitch at the rate of 3 or 4 lb. per 100 galls. In a series of tests covering many years Bordeaux mixture proved slightly more effective as a fungicide than the iron sulphate and lime-sulphur mixture, but for practical purposes the difference may be disregarded. Both Bordeaux and lime-sulphur with lead arsenate are liable to cause russeting of the fruit [ibid., xv, p. 37], a drawback not associated to any appreciable extent with the iron sulphate treatment. Care must be taken, however, not to apply the last-named too late in the season, when the colour of the fruit may be adversely affected.

GRAM (E.) & STAPEL (C.). **Forsøg med Foraarskarbolineum.** [Experiments with spring carbolineum.]—*Medd. Forsøgsv. Plantek. Kbh.*, 242, 3 pp., 1935.

Very good control of *Sclerotinia laxi* f. *mali* on apples [*R.A.M.*, viii, pp. 179, 254; xiv, p. 703] was given in the official tests in Denmark in 1934 by spring applications of abolin (a product of German origin taken over by the Danish firm J. Svendsen) dissolved in Bordeaux mixture, the action of the substance in lime-sulphur being slightly weaker. In 1935 abolin, krimpol, and mentin (the two last obtainable, respectively, from A/S Carbokrimp and Dansk Olieindustri) were all effective for the same purpose at the rate of 10 l. in 90 l. Bordeaux mixture (2–1–100), reducing the incidence of infection from between 8 and 9 to between 1 and 2 per cent. In mild attacks the preparations may be used in lime-sulphur at the rate of 6 instead of 10 l. This group of fungicides is known as 'spring carbolineum' in contrast to the ordinary winter preparations of the same type [ibid., xiv, p. 597].

CROWELL (I. H.). **The hosts, life history and control of Gymnosporangium clavipes C. and P.**—*J. Arnold Arbor.*, xvi, 4, pp. 368–410, 6 pl., 2 graphs, 1 map, 1935.

A fully tabulated account is given of the author's studies, conducted over a period of four years in the Arnold Arboretum, of quince rust, *Gymnosporangium clavipes* (also known as *G. germinale* [*R.A.M.*, xiii, p. 247], a name based on the aecidial stage), found only in North America.

Inoculations and field observations on approximately 700 species and varieties in 13 genera of Pomaceous plants showed that 480 species and varieties were susceptible, distributed among the following genera: *Amelanchier*, *Amelosorbus*, *Aronia* [*Amelanchier*], *Chaenomeles* [*Pyrus*], *Crataegomespilus*, *Crataegus*, *Cydonia*, *Malus* [*Pyrus*], *Photinia*, *Pyrus*, and *Sorbus* [*Pyrus*]. Similar data regarding the genus *Juniperus* as well as records in the literature showed the following to be susceptible,

viz., *J. communis* and its vars. *depressa*, *hibernica*, and *montana*, *J. horizontalis*, *J. sabina*, *J. scopulorum*, and *J. virginiana*. Both classes of hosts occur over most of the north-temperate region.

On Pomaceous hosts the disease occurred most frequently on the fruits, less so on the twigs and buds, causing hyperplastic distortion, and was rarely found on the leaves, on which it was confined to small, usually partially necrotic spots. The infected buds, besides being swollen, were forced to develop more than is usual for the current season. On some fruits, particularly apples, the disease was limited to small hypoplastic lesions, usually at the blossom end. The flowers and fruits of certain Pomaceous hosts were found to be susceptible only for a brief period after being released from the buds.

On its *Juniperus* hosts the rust, though most abundant on one- to five-year-old twigs was also found on the leaves, branches, and main trunk. The diseased leaves were discoloured and slightly swollen, and were usually killed in one or two years. On the twigs and branches the disease was perennial for several years; they were usually girdled and covered with a thick, flaky, or furrowed, blackened bark. On the main trunk the disease was usually confined to elongated, swollen patches.

The life-history of the fungus is essentially the same as that of other species of the genus. The optimum temperature for the germination of the aecidiospores was about 15° C. In forced buds of aecidial hosts the mycelium was systemic, progressively developing spermogonia, rarely aecidia, as the buds elongated. On *Juniperus* hosts the mycelium was confined to the epidermis of the leaves and the phellogen of the twigs, branches, and main trunk. Teleutosori were produced annually on infected organs. Measurements of the aecidiospores are given as 32·2 by 34·4 μ with extremes of 28·4 to 42·3 by 26·7 to 37·4 μ; those of the peridial cells as 55·6 by 14·5 μ (33·4 to 83·5 by 10·4 to 23·4 μ); and the teleutospores as 44·5 by 22·7 μ (33·0 to 57·8 by 16·5 to 33·0 μ), 94·8 per cent. of the last-named being bicellular and the rest unicellular.

Control consists in the selection of resistant species, planting a screen of tall, non-susceptible trees round groups of alternate hosts, eradicating all hosts over a radius of at least half a mile, removing the infected parts, and spraying with linco colloidal sulphur [ibid., xiv, p. 684] both Pomaceous and *Juniperus* hosts.

Maclachan (J. D.). **The dispersal of viable basidiospores of the Gymnosporangium rusts.**—*J. Arnold Arbor.*, xvi, 4, pp. 411–422, 2 figs., 1935.

Evidence having been obtained that the basidiospores of certain *Gymnosporangium* rusts in North America can produce infection on alternate hosts seven or eight miles distant from the source of inoculum, spore collections were made by aeroplane at different altitudes over red cedars [*Juniperus virginiana*] infected by *G. juniperi-virginianae* [*R.A.M.*, xiv, p. 771] immediately after a rainy period, on 5th May, 1935. The results obtained [which are tabulated and discussed] showed that viable basidiospores of *G. juniperi-virginianae* were present in the air at altitudes up to at least 2,000 ft. In laboratory tests the basidiospores were killed at 0 per cent. humidity at all temperatures in 22 hours, and at temperatures over 30° C. under all humidity conditions

within the same period. At humidities over 25 per cent. and temperatures below 25° they could live long enough to blow many miles while still remaining viable, and such conditions prevail locally during the normal dispersal of these rusts. Experience has shown, however, that the eradication of red cedars within a radius of one to two miles will, as a rule, fully protect the Pomaceous host from harmful infection by species of *Gymnosporangium*.

TINDALE (G. B.) & TROUT (S. A.). **The preservation and storage of fruit.**—*J. Aust. Inst. agric. Sci.*, i, 3, pp. 109–111, 1935.

The authors give a few brief notes on the results of the researches carried out in Melbourne on the longevity of various fruits in cool storage, by the Australian Council for Scientific and Industrial Research in collaboration with the Victorian Department of Agriculture. The results with pears have already been noticed from another source [*R.A.M.*, xiii, p. 709]. The behaviour of plums in cool storage [cf. ibid., xiv, p. 321] is very similar to that of pears; they also require picking when green but fully developed and storage at a temperature from 30° to 32° F., and must be removed from storage before the climacteric is passed to avoid the development of mealiness and internal browning; even under such conditions the storage life of most plum varieties is only seven or eight weeks, while that of peaches [cf. ibid., xiv, p. 773] is even shorter. Both oranges and apples [cf. ibid., xiv, p. 41] are usually picked closer to their climacteric than pears, but they can be stored for a longer period afterwards, the respiration curve falling slowly. Subsequently respiration increases again, but shortly after the orange in particular appears to lose all natural resistance to mould [*Penicillium* spp.] attack. The study of the respiration curve is regarded as practically essential to a proper understanding of storage behaviour.

HEUBERGER (J. W.). **Fruit-rotting Sclerotinias—IV. A cytological study of Sclerotinia fructicola (Wint.) Rehm.**—*Bull. Md agric. Exp. Sta.* 371, pp. 167–189, 4 pl., 1 fig., 1934. [Abs. in *Exp. Sta. Rec.*, lxxiii, 6, pp. 801–802, 1935.]

The microconidia of *Sclerotinia fructicola* [*R.A.M.*, xv, p. 103] described in this cytological study of the fungus are uninuclear and produced in chains on bottle-shaped sterigmata, from which they are severed by the formation of a septum in the neck. These organs developed more abundantly at P_H 5·5 and 7·9 than at 4·1, the chief factor determining their production being a limitation in carbohydrate supply. The occurrence of the microconidia on the surface of mummies in late winter may indicate that they fertilize the apothecial fundaments, then in course of formation just below the sclerotial surface. Cytological details are given of the three distinct types of nuclei occurring in the life-cycle of *S. fructicola* and of ascus development.

WILLISON (R. S.) & CHAMBERLAIN (G. C.). **Studies in fruit diseases. VIII. Preventing Peach canker.**—*Circ. Dep. Agric. Can.* 92, 8 pp., 4 figs., 1935.

A popular discussion is given of cultural practices in Ontario

orchards in relation to the serious and widespread peach canker caused by *Valsa cincta* [*R.A.M.*, xiv, p. 594 and next abstract].

The later stages of the disease are easily recognizable by the shrivelled, blackish, loose, dead bark and the presence of several more or less concentric ridges round the canker, often accompanied by gummy exudations. Less familiar is the incipient phase developing in the spring and marked externally by slightly sunken, sometimes discoloured areas, corresponding to moist, brown lesions in the bark tissue, which dry out during the summer. In view of the fact that infection by *V. cincta*, which takes place through wounds, is most prevalent shortly before and after leaf fall, it is advisable to delay pruning at any rate until January and preferably until March, when the cuts are likely to heal thoroughly and rapidly. A prolific source of trouble is carelessness in cleaning up the cuts, in the manipulation of implements, and in the removal of dead wood. Care should also be taken to avoid damaging the trees during cultural operations and measures should be adopted to combat the insect pests liable to inflict injuries.

Over a five-year period three plots in the orchard of the Dominion Laboratory of Plant Pathology, St. Catharines, have been sown with a cover crop on 15th June, 15th July, and 15th August. Records show a striking increase in the number of cankers and winter injuries in the plots cultivated until 15th August, and it is therefore recommended that the season of open cultivation in peach orchards should cease in the first week of July to admit of proper maturation of the trees before winter.

Common sites of infection by *V. cincta* are the twig and spur lesions caused by the brown rot fungus [*Sclerotinia fructicola*], the summer treatment of which will thus automatically help to control canker.

Large, irremovable cankers situated at crucial points on the trunk or main branches should be thoroughly cleaned out in the spring, and immediately afterwards disinfected with mercuric chloride 1 in 500 and painted with a thin paste of white lead or asphalt and boiled linseed oil.

Steven (W. F.). **Studies on the cultural behaviour and pathogenicity of a strain of Valsa.**—*Phytopath. Z.*, viii, 5, pp. 489-505, 1 pl., 5 graphs, 1935.

A tabulated description is given of the author's studies on the cultural behaviour and pathogenicity of a strain of *Valsa* isolated from *Sorbus* [*Pyrus*] *chamaemespilus* by G. Défago and placed by him in the subgenus *Leucostoma*, affinities with *V. nivea* and *V. persoonii* being noted. The rate of growth as estimated by the dry weight of mycelium increased from 3° C. to about 33° and then fell sharply, the amount produced indicating a physiological distinction from *V. cincta* [see preceding abstract], *V. nivea*, and *V. persoonii*. The optimum temperature for radial growth was around 27° and none occurred at 36° while the optimum hydrogen-ion concentration was between P_H 4·8 and 5·1. Low atmospheric humidity hastened the development of spores in agar cultures provided pycnidial growth is not checked while no spores were formed above 82·7 per cent. humidity.

Inoculation experiments with *V. nivea* from poplar, *V. persoonii*

from peach and Mahaleb cherry, *V. cincta* from apricot, and the strain from *P. chamaemespilus* on pear, *S.* [*P.*] *aucuparia*, and *S.* [*P.*] *aria* var. *majestica* by Togashi's burning method [ibid., iv, p. 612] showed *V. cincta* to be the most strongly pathogenic, but even this species spread exclusively in tissues weakened by other causes. In this respect as in others the *P. chamaemespilus* strain is intermediate between *V. nivea* and *V. persoonii*.

THORNTON (J. K.). **Blackberries: possible source of streak infection in Black Raspberries.**—*Phytopathology*, xxv, 10, pp. 959–961, 1935.

During the summer of 1932 four cases of severe infection by streak on black raspberries [*Rubus occidentalis*: *R.A.M.*, xi, p. 381] growing in close proximity to blackberries were observed in plantings entered for certification in Pennsylvania, and a similar instance occurred in the following year. Only mild symptoms of the disease [ibid., xii, p. 230] were detected in black raspberry plantings at a distance of 500 ft. or more from blackberries. In one case the percentage of streak on 1st July, 1932, in two rows of Eldorado blackberries was 1, while on the same date it amounted to 30 in two adjoining rows of Plum Farmer black raspberries, to 10 in the three next rows of black raspberries (Cumberland), and to 2 in the three rows (Plum Farmer) at the greatest distance from the blackberries, the corresponding figures for 1st August being 1, 60, 15, and 4, respectively. Records are available to show that severe streak infection in black raspberries is consistently associated with proximity to blackberries. In two cases the streak percentages in black raspberries adjoining blackberries increased from 6 and 5 per cent., respectively, in 1931 to 30 and 75 per cent., respectively, in 1932. In 1933 all the black raspberries in a planting interspersed with blackberries were diseased but only one blackberry showed suspicious symptoms. However, notwithstanding the frequent absence of the latter, there is considered to be an evident correlation between streak in blackberries and its subsequent spread to *R. occidentalis*.

DARROW (G. M.). **Susceptibility of Raspberry species and varieties to leaf spot (Mycosphaerella rubi) at Beltsville, Maryland.**—*Phytopathology*, xxv, 10, pp. 961–962, 1935.

A table is given showing the relative resistance in Maryland, in comparison with the Latham and Chief, of a number of raspberry species and varieties to the serious leaf spot (*Mycosphaerella rubi*) [*R.A.M.*, xiii, p. 174; xiv, p. 181]. Among those more resistant than Latham may be mentioned *Rubus biflorus*, *R. incisus*, *R. innominatus*, *R. inopertus*, *R. kuntzeanus*, *R. mesogaeus*, *R. niveus*, *R. parvifolius*, *R. phoenicolasius*, *R. rosaefolius*, *R. veitchii*, Van Fleet (*kuntzeanus* × Cuthbert), and various U.S.D.A. and N.Y. selections. Equally resistant with Latham and Chief are four black (*R. occidentalis*) varieties, Bristol, Dundee, Golden King, and Naples, Potomac purple, two U.S.D.A., and four N.Y. selections, while the varieties more susceptible than Latham include Cumberland, Farmer, Perfection, Quillen, and six other black varieties, two red varieties (June and White Queen), and one purple (Royal).

Brooks (A. N.). **A Rhizoctonia bud rot of Strawberry.**—Abs. in *Phytopathology*, xxv, 10, pp. 965–966, 1935.

Rhizoctonia [*Corticium*] *solani* causes a dry rot of the leaves, flower-buds, and petiole and stipule bases of strawberries from November to March in Florida [*R.A.M.*, xi, p. 661; xiv, p. 563]; the older leaves droop and lie flat on the ground and the affected plants may die, though recovery sometimes takes place by means of adventitious buds. The fruits are subject to this rot at any stage of maturity. Healthy plants in sterile soil readily contract the disease on inoculation with the sclerotia of the fungus either through the buds or soil. Control measures should include lowering the organic soil content by the reduction of summer cover crops and either wider spacing of the plants in the beds or later setting to maintain bushes of smaller size and so to provide adequate circulation of air round the plants.

Nolan (R. E.). **Sclerotium rolfsii Sacc. on Strawberries and the effect of certain chemicals on the sclerotia.**—Abs. in *Phytopathology*, xxv, 10, p. 966, 1935.

Sclerotium rolfsii is stated to have caused severe infection of strawberries [*R.A.M.*, iii, pp. 381, 704] during the past three years in the Plant City area [Florida], especially during warm weather. Any part of the plant is liable to attack, though the base of the petiole and stipules is generally the first to be invaded. The fungus then proceeds to destroy the buds, which may or may not be replaced later. Newly set plants are occasionally attacked in the spring, their root systems being covered with a mass of white mycelium and the roots light brown. Sclerotia are sometimes formed after the death of the plants. Some of the small berries show an irregular, light brown, soft spotting on the soil side during the fruiting season. At maturity a profusion of white mycelium is produced, covering the berry and causing a soft rot. When the berry is consumed the mycelium disappears, leaving a mass of sclerotia and strawberry seed on the surface of the soil.

A saturated atmosphere was shown by inoculation tests to stimulate sclerotial germination and infection. Formaldehyde and carbon sulphide were the most effective of the chemicals tested for the destruction of the sclerotia.

Parham (B. E. V.). **Annual Report on Banana disease investigations, 1934.**—*Annu. Bull. Dep. Agric. Fiji*, pp. 41–48, 1935.

During 1934, *Cercospora musae* [*R.A.M.*, xiv, pp. 44, 216] was common on leaves of banana plants in Fiji, but its virulence varied with the growth conditions of the plant and it appeared invariably to be secondary to other adverse factors. The following varieties have so far shown immunity: Lady's Finger, Mysore, Blue Java, Vudi loaloa, Soaqa (*Musa fehi*), 'Jamaica', and Jamaica vula; of the oba varieties, Bawa, Baloa, Sauvai, and Jamani vula show resistance, while of the commercial varieties, one strain of Gros Michel ('Domoloa') and one of Cavendish gave indication of possessing some resistance. A species of *Mycosphaerella* found in association with *C. musae* is thought possibly to be its ascigerous stage.

A species of *Fusarium* identical in all its cultural and morphological characters with *F.* [*oxysporum*] *cubense* was associated with a severe banana wilt; the external symptoms and the effect of the fungus on the plant tissues were characteristic of Panama disease. At Kaivala Bay, Kadavu, devastated plantations covering 50 acres were destroyed by the Department of Agriculture as a precautionary measure. The isolation of a similar species of *Fusarium* from diseased bananas on the mainland of Viti Levu leads the author to conclude that Panama disease and 'Sigatoka' [ibid., v, p. 715] are identical. Satisfactory results in the eradication of diseased stools were given by diesolene oil (S.G. 0·8505, C.F.P. 186°), used at the rate of ½ pint per stool, costing 30*s.* per acre, any suckers that survived the treatment being easily removable by hand.

Cordana [*Scolecotrichum*] *musae* [ibid., xiv, p. 45] and *Uromyces musae* [ibid., xiv, p. 608] are common leaf pathogens of banana in Fiji, the former producing large, diamond-shaped lesions with a yellow margin and the latter characteristic masses of rusty brown spores on the under surface of the leaves of all 'China' bananas and Lady's Finger.

Gloeosporium musarum [ibid., xv, p. 104] was commonly present on the persistent bracts of the Cavendish variety, on the fruits of which it caused spotting; in association with insect infestation it produced severe cracking and rotting of maturing Cavendish fruits. It caused a severe finger-stalk rot and fruit spotting of the Veimama and Cavendish varieties. Young lesions were discernible on fruit at the half stage, infection taking place in the plantation. Preliminary experiments indicated that control is possible by routine spraying at the critical pre-infection stage or by ripening in the dark or in rooms with reduced ventilation, the prevention of infection apparently depending upon an accumulation of the carbon dioxide of respiration.

The role of *Marasmius* sp. [ibid., xiv, pp. 45, 154] as a banana pathogen has still to be established. The mycelium and rhizomorphal strands may be traced well into the sheathing bases of the pseudostem, but penetration does not take place until the moisture content of the tissues has become reduced. Subsequently, the fungus progresses rapidly, the outer, drier leaf bases being quickly rotted, even though no fructifications are present. Sporophores were found from January to June, always abundantly on bananas affected by Sigatoka, their presence emphasizing the morbid condition of the plants. *M.* sp. is thought probably to be a saprophyte with a weakly parasitic tendency.

All the clones of Cavendish bananas appear to be affected by bunchy top [ibid., xiv, p. 112] which may not become manifest except under adverse growth conditions or until fruiting time. Both the disease itself and the vector, *Pentalonia nigronervosa*, are becoming markedly more prevalent, the proportion of plants affected in different localities ranging from 10 to 50 per cent.

Other banana diseases studied included a wilt of plantains from which bacteria only were isolated from discoloured vascular strands, and a spotting of the leaves and petioles of certain plantain varieties attributed to *Fusarium*.

Lady's Finger appears to be identical with the Fillbasket or Mysore banana used as an analysing male parent in breeding work in Trinidad. It is resistant to Sigatoka and very rarely affected by bunchy top.

Wilcoxon (F.) & McCallan (S. E. A.). **Fungicidal action of organic thiocyanates, resorcinol derivatives, and other organic compounds.** —*Contr. Boyce Thompson Inst.*, vii, 3, pp. 333–339, 1935.

A tabulated account is given of the results of toxicity tests [cf. *R.A.M.*, xiv, p. 244] of 32 listed organic compounds to the conidia of *Sclerotinia fructicola*, *Botrytis paeoniae* [ibid., xv, p. 99], and *Pestalotia* [*Pestalozzia*] *stellata*. The compounds tested included organic thiocyanates, thiazoles, resorcinol derivatives, and other phenolic compounds, and their fungicidal activity was compared with that of copper sulphate and formaldehyde, the criterion of toxicity being the LD50 [loc. cit.]. The thiazoles, catechol, and protocatechuic acid [ibid., xiv, p. 553] were found to be of comparatively low toxicity, the concentrations required to inhibit the germination of the conidia being so high as to render their use in practice unlikely. The thiocyanates, and the alkyl and acyl derivatives of resorcinol [ibid., xiv, p. 105] proved to be highly toxic, some members of this series being nearly as effective as copper sulphate; potassium thiocyanate, however, was not toxic. Formaldehyde was less toxic than might be expected from its widespread use.

Preliminary greenhouse experiments with tomato leaf mould (*Cladosporium fulvum*) [ibid., xiv, p. 662] indicated that while trimethylene dithiocyanate was equal to Bordeaux mixture and sulphur dust in controlling the disease, in some cases it caused a slight burning of the growing tips; none of the other compounds tested gave satisfactory control.

De Francolini (J.). **Observations sur le pouvoir mouillant des bouillies antiparasitaires.** [Notes on the wetting capacity of antiparasitic mixtures.]—*Rev. Path. vég.*, xxii, 4, pp. 284–287, 1935.

In this brief note the author states that experiments have shown that a commercial spreader may lower by varying degrees the surface tension of different insecticidal and fungicidal sprays to which it is added, the same product giving excellent results with one spray and being entirely ineffective for another. Consequently, the effect of any spreader should be determined experimentally before adopting it for practical use with a given spray [cf. *R.A.M.*, xiv, p. 597]. It was further shown that the wetting capacity [ibid., xv, p. 105] of any one spray liquid is only satisfactory when its surface tension has been reduced to or below about 0·65 of that of distilled water, taken as the unit of measurement. With cupric or arsenical sprays, however, lowering the surface tension below the point where these liquids wet the leaf surface tends also to lower their efficacy.

Desrue [A.]. **Bouillies mouillantes et mouillants.** [Wetting sprays and wetters.]—*Progr. agric. vitic.*, civ, 36, pp. 228–231; 37, pp. 257–262, 1935.

While freely admitting the great interest of laboratory studies on

the wetting capacity of spray liquids (insecticides and fungicides), the author points out that such studies are of little value in agricultural practice in view of the highly complex and infinitely variable environmental conditions met with in the field, as well as of the extremely heterogeneous nature of the sprays themselves, especially of those that are prepared more or less empirically by the growers [*R.A.M.*, xiii, p. 45]. His own extensive practical experience conclusively shows that the amount of a wetting agent (for which he again recommends terpene alcohols (emol) [loc. cit.; ibid., xv, p. 105] as very efficacious and suitable for most crops) to be added to a spray varies considerably with the host plant treated, its stage of growth, and weather and other environmental conditions; this renders the use of a fixed formula undesirable, and in his view, the only way out of the difficulty is that this amount should be empirically determined on a few plants before every application, and at least twice daily even with one and the same crop [see preceding abstract].

Pease (Dorothy). **A method for irrigating fungus cultures.**—*Science*, *N.S.*, lxxxii, 2129, pp. 377–378, 2 diags., 1935.

The author describes a method for renewing the supply of moisture in fungus cultures. A van Tieghem ring is enclosed in the Petri dish and the agar is poured round the ring, which thus becomes an empty glass well in the centre of the plate. Sterile water, introduced into the ring, slowly seeps out into the agar and can be replenished as required. The method is also appropriate for nutritional experiments and may be applied to cultures in Erlenmeyer flasks by using a 2 in. length of glass tubing 18 to 20 mm. in diameter in place of the ring.

Bodine (E. W.). **Sclerotinia wilt of Canada Thistle.**—*Phytopathology*, xxv, 10, pp. 963–964, 1 fig., 1935.

Sclerotinia sclerotiorum was isolated from dying Canada thistle (*Carduus* [*Cnicus*] *arvensis*) plants in Colorado and inoculated with positive results on the same host, potato, tomato, bean [*Phaseolus vulgaris*], lettuce, celery, and sunflower [*R.A.M.*, xiii, p. 638]. On *C. arvensis* the fungus produces within five days soft, grey to dark brown, water-soaked cankers on the roots, to which the persistent lignified tissues impart a shredded appearance. Attempts to destroy the weed by means of the fungus were only partially successful, a vigorous fringe of the thistle advancing ahead of the control agent and forming 'fairy rings'. For this reason, and on account of its wide host range, *S. sclerotiorum* is not adapted for the purpose in view.

Proctor (B.). **The microbiology of the upper air. II.**—*J. Bact.*, xxx, 4, pp. 363–375, 1935.

A tabulated account is given of the microbiological results obtained in 30 aeroplane flights near Boston between April and November, 1934 [*R.A.M.*, xiv, p. 326], the journeys being performed between 7 and 9 a.m. The collection apparatus consisted essentially of a rotatory brass plate perforated by six holes in which were inserted disks of oiled paper on a wire screen support, and the air current was arranged

to traverse each paper in turn by rotating the plate. The entire apparatus was sterilized by heat before use. Shortly after the completion of the flight the oiled paper filters were removed to a sterilized glass cell, and after direct examination were shaken up in sterile water from which Petri dishes were then poured.

Aspergillus and *Penicillium* spp. were the most common moulds trapped at altitudes above 10,000 ft., 12 cultures of the former and 6 of the latter being obtained, while representatives of the following genera were also isolated from this series of flights: *Rhizopus*, *Mucor*, *Oospora*, *Monosporium*, *Macrosporium*, *Tilachlidium*, and *Fusarium*.

DALE (H. H.). **Viruses and heterogenesis. An old problem in a new form.**—*Huxley Mem. Lect., 1935*, 24 pp., 1935.

After concisely summarizing the history of the filterable or ultramicroscopic viruses [*R.A.M.*, xv, p. 40], with special reference to their biogenetic or heterogenetic origin, the author discusses the evidence for and against the theory of biogenesis. The striking uniformity in the properties and behaviour of the different viruses would seem to contradict the view that at some unspecified level of unitary dimensions the apparently self-propagating infective organisms are transformed into autogenous transmissible toxins. Constantly improving technical methods have already revealed as independent organisms certain infective principles previously unrecognized as such, and there is reason to believe that further advances in this direction will establish the validity of biogenesis as an explanation of the viruses.

THORNBERRY (H. H.). **Particle diameter of certain plant viruses and Phytomonas pruni bacteriophage.**—*Phytopathology*, xxv, 10, pp. 938–946, 1935.

The author explains the technique, discusses the results, and tabulates the statistical data of ultrafiltration analyses, which showed the following viruses and strains thereof to be composed of particles some 15 $\mu\mu$ in diameter according to Elford's method of calculation [*R.A.M.*, xii, p. 646], substituting Mallinckrodt's parlodion (*J. gen. Physiol.*, xviii, p. 143, 1934) for 'necol' as a source of collodion: Johnson's tobacco mosaic 1 and 6 (yellow) [*R.A.M.*, xiv, p. 660; xv, p. 122], Holmes's masked tobacco mosaic [ibid., xiii, p. 399], tomato aucuba mosaic [Johnson's tobacco virus 6: ibid., xiv, p. 261], Kunkel's second attenuated strain of aucuba mosaic [ibid., xiii, p. 648], Jensen's yellow tobacco mosaic [ibid., xiii, p. 329], Valleau's yellow and green ring spots of tobacco [ibid., xiv, p. 812], Wingard's tobacco ring spot [ibid., vi, p. 699], Porter's cucumber mosaic virus 1 [ibid., xiv, p. 811], and Johnson's ring spot of potato [ibid., xiv, pp. 660]. Particles of the tobacco mosaic virus purified by the lead acetate procedure [see below, p. 177] passed membranes of 33·84 $\mu\mu$ pore diameter but not those of 26·27 $\mu\mu$ while the non-purified virus was retained by the former. On the basis of the results with the purified virus, the particles are estimated to measure about 11 $\mu\mu$; the dimensions of the *Phytomonas* [*Bacterium*] *pruni* bacteriophage [ibid., vii, p. 432] were also determined as approximately 11 $\mu\mu$.

Renner (Sophie). **Beitrag zur Kenntnis einiger Wurzelpilze.** [A contribution to the study of some root fungi.]—*Phytopath. Z.*, viii, 5, 457–487, 12 figs., 3 graphs, 1935.

A detailed, tabulated account is given of investigations at the Federal Technical College, Zürich, on mycorrhizal associations in *Salix repens*, *Schoenus ferrugineus*, *Acer platanoides*, and *A. pseudoplatanus*, of which the last-named proved to be the best adapted to synthetic experimentation [cf. *R.A.M.*, xiii, pp. 590, 793].

In *Salix repens* the roots are surrounded with a fungal mantle and infection was found to be confined to the epidermal cells. The roots of *Schoenus ferrugineus* showed dark-coloured, sack-shaped swellings, 4 by 1 to 1·5 mm., tapering towards the tip, without root hairs, and containing a profusion of hyphae, this being apparently the first record of true mycorrhizal tumours in the Cyperaceae. Numerous interwoven hyphae also filled the cortical cells of *A. platanoides* and *A. pseudoplatanus* roots. The fungi were isolated from the root tissues on malt agar and Knop's medium and are subsequently referred to as *Mycelium radicis salicis*, *M. r. schoeni*, and *M. r. aceris* [cf. ibid., xiv, p. 187], the exact determination of their systematic position being impracticable. The three fungi are closely similar in general habit, all forming a white mycelium, the lower strata of which rapidly turn brown, consisting of septate hyphae, 5 to 6 μ in diameter in *M. r. aceris* and *M. r. schoeni* but only 2 to 3 μ in *M. r. salicis*. Conidia [which are not described] are abstricted from the hyphal tips, sometimes in chains, by *M. r. salicis* and *M. r. schoeni*. The addition to Knop's solution of 4 per cent. cane sugar was found to promote growth, which was most abundant in the case of *M. r. schoeni* and least so in that of *M. r. aceris*. In Knop's medium the optimum temperature for the development of *M. r. aceris* was 21° C., while the other two grew best at 24°; *M. r. salicis* was the only one of the three organisms to develop above 27°. On malt agar the optima for *M. r. aceris*, *M. r. salicis*, and *M. r. schoeni* were 21°, 24°, and 21°, respectively; the last-named proved to be the most sensitive to extremes of temperature, its range being only from 9° to 27° compared with 3° to 33° for *M. r. salicis*. All the fungi induced gradual alkalization of the medium during the period of growth, *M. r. aceris* attaining P_H 5·16, *M. r. salicis* P_H 6·70, and *M. r. schoeni* P_H 7·63 in about two months. Cold phosphatide extracts of *Acer* seeds favoured the development of *M. r. aceris*, while hot ones made no difference to it but injured *M. r. salicis*. Ammonium sulphate and asparagin were the best sources of nitrogen, the assimilation of which from the atmosphere appears to be improbable.

The facts that the mycorrhizal fungi under observation are capable of killing weak plants, e.g., water cultures, but not vigorous individuals rooted in soil, and that they are not essential to the germination of their respective hosts, are considered to support the view that they are parasites.

Schopfer (W. H.). **Facteurs de croissance et vitamines chez les champignons.** [Growth factors and vitamins in fungi.]—*Mitt. naturf. Ges. Bern, 1934*, pp. xxxv–xxxvii, 1935.

The author describes the reaction of *Phycomyces* sp. and several other

fungi (including *Mucor ramannianus* [*R.A.M.*, xiv, p. 247], *Absidia ramosa*, *A. orchidis*, *Mucor mucedo*, *Rhizopus suinus*, and *Saccharomyces cerevisiae*), to the 'growth factor' contained in yeast, wheat germ, some pollens, and the like, and consisting of vitamins B_1 and B_2, bios [ibid., xv, p. 109], and other substances. The conclusion is reached that at least two factors are involved, one with a specific action (B_1) and the other with a more generalized effect (growth factor of Mucorineae or M). Evidence was obtained indicating that *P.* sp. is able to synthesize B_1 itself. It is noteworthy that the species most dependent on the presence of vitamin B_1 are more or less parasitic and incapable of an independent existence.

The results of experiments carried out by Burgeff with extracts of the growth factors supplied by the writer in 1933 are stated further to indicate the possibility of replacing the orchid endophyte [*Rhizoctonia repens*: ibid., xv, p. 108] by M but not by B_1.

RAISTRICK (H.). **Division of biochemistry and chemistry as applied to hygiene.**—*Rep. Lond. Sch. Hyg., 1934–5*, pp. 27–30, 1935.

In this account of work carried out at the London School of Hygiene and Tropical Medicine, the author indicates the progress made during 1934–5 in the biochemical investigation of various metabolic products of fungi, including new derivatives formed by species of *Helminthosporium*; ravenelin, a pigment produced by *H. ravenelii* [*R.A.M.*, x, p. 463]; byssochlamic acid formed by *Byssochlamys fulva* [ibid., xiv, p. 775]; two crystalline pigments of *Fusarium culmorum*; and a number of products of species of *Penicillium* and *Aspergillus*. The papers published by members of the Division during the year are listed on pp. 58–59 of the Report.

MORRIS (H. E.) & YOUNG (P. A.). **Potato diseases in Montana.**—*Bull. Mont. agric. Exp. Sta.* 300, 49 pp., 24 figs., 1935. [Abs. in *Exp. Sta. Rec.*, lxxiii, 6, p. 797, 1935.]

This bulletin (a revision of No. 227 in the same series) is stated to have been prepared chiefly for the use of growers and contains, in addition to previously published observations on the chief potato diseases and their control in Montana [cf. *R.A.M.*, x, p. 263; xiii, p. 257], a description of a physiological mottling affecting mainly the early-formed leaves. A key to the tuber, stem, and leaf diseases is appended.

ESNAULT (O.) **Les maladies de dégénérescence de la Pomme de terre.** [Potato degeneration diseases.]—*Vie agric. rur.*, xxiv, 41, pp. 235–236, 1935.

Popular notes are given on leaf roll and crinkle of potatoes, which are stated to be causing steadily increasing losses in the Department of Seine-Inférieure, France [*R.A.M.*, x, p. 266; xii, p. 491, *et passim*], and on their control by means of selection.

WARTENBERG (H.), HEY (A.), & URHAN (O.). **Die elektrometrische Pflanzgutwertbestimmung der Kartoffelknolle. I. Mitteilung.** [The electrometric determination of the seed value of the Potato tuber. Note I.]—*Arb. biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, xxi, 3, pp. 331–362, 1 fig., 1 diag., 7 graphs, 1935.

This is a highly technical, tabulated discussion on the foundations of the electrometric method of determining the value of potato tubers for seed, with a view to the elimination by this means of individuals suffering from 'degeneration' [*R.A.M.*, xiv, pp. 78, 388, and cf. next abstract]. A description is given of the necessary preliminaries to the work of measurement, the apparatus used, and the process of determination, followed by an account of the conditions permitting the comparison of potential values measured by different platinum electrodes.

Special investigations were required to explain the division of the measuring process into two parts, viz., potential drift and potential constancy, the former being interpreted in part as a sequel to inevitable polarization effects and partly as a function running its course in the potato tissue emulsion. It was impossible to decide, within the limits of these studies, whether potential constancy corresponds to the true potential formation of an active, unchangeable system, or if it is a drift of which the extent cannot be gauged in the 30 to 40 hours occupied by the measuring process.

KLINKOWSKI (M.). **Die Bechholdsche Kupferprobe als diagnostisches Hilfsmittel zur Beurteilung des Gesundheitszustandes von Kartoffelknollen.** [The Bechhold copper test as a diagnostic aid in the determination of the state of health of Potato tubers.]—*Phytopath. Z.*, viii, 5, pp. 421–455, 8 figs., 2 graphs, 1935.

In the application of the Bechhold copper test for the determination of the state of health of potato tubers in respect of degeneration [*R.A.M.*, xiv, p. 785 and cf. preceding abstract], certain conditions must be scrupulously observed. For instance, the sheet-copper strips must be smooth, thin, and sharp-edged, and should be carefully wiped before use. Tubers for testing purposes must be whole and free from injury or external symptoms of disease, while those that have undergone excessive evaporation in storage should be excluded. The results of greenhouse and field trials indicate a limited diagnostic value for the method, the practical application of which is restricted, however, by the lack of uniformity in the data obtained with tubers of different varieties and from divergent localities. Pending further improvements in the experimental technique, therefore, the copper strip method should only be regarded as an auxiliary means of judging potato deterioration.

COSTANTIN (J.). **La cultivation de la Pomme de terre au Maroc.** [Potato cultivation in Morocco.]—*C. R. Acad. Agric. Fr.*, xxi, 24, pp. 932–933, 1935.

The information in this note is stated to be based on recent researches by E. Miège, who has ascertained that potato cultivation in Morocco

dates back to before 1830 in the region of Fez. The crop is grown by the natives exclusively in mountainous regions at an altitude of 850 to 1,700 m. above sea-level, where the very high yields (up to 35,000 kg. per hect.) compare favourably with those obtained in the plains at Rabat [cf. *R.A.M.*, xiv, p. 785]. Not a sign of degeneration has been observed notwithstanding the repeated use for indefinite periods of tubers of the same variety.

BAWDEN (F. C.). **The relationship between the serological reactions and the infectivity of Potato virus 'X'.**—*Brit. J. exp. Path.*, xvi, pp. 435–443, 1935.

Continuing his serological studies of the potato virus X [*R.A.M.*, xiv, p. 713], the author gives details of experiments with Salaman's S strain of the virus, which is serologically indistinguishable from the G and L strains [ibid., xii, p. 581] but differs from them in that it produces local necrotic lesions on *Nicotiana glutinosa*. The results showed that a close direct relationship exists between the antigen content of purified suspensions of the strain S, as measured by their optimal flocculation points with antisera, and their virus content, as measured by the local lesion method. In the majority of the experiments the strengths of the suspensions were found to lie in the same order when compared by both methods, while in some tests the relation between the dilution of antiserum in the optimal tube and the number of local lesions produced was almost linear. The relationship, however, was found to hold only when the suspensions compared were prepared in the same manner, and, furthermore, the two methods of estimating concentration gave different results when different mixtures of strains of potato virus X were compared. It is believed that the antisera provide a quantitative method of working with such viruses, and that they also afford a reliable estimate of the total virus in a mixture of strains, where the results from lesion counts would be misleading.

Inactivation of the virus by heating the suspensions above 66° C., by ageing *in vitro*, or by 85 per cent. alcohol was accompanied by the loss of flocculating power with antiviral sera. Formalin inactivated the suspensions but left the flocculating power unimpaired, while phenol greatly reduced and altered the flocculation but did not completely destroy it. Certain precipitants had the same effect on both the antigen and the virus.

BLODGETT (F. M.) & COWAN (E. K.). **Relative effects of calcium and acidity of the soil on the occurrence of Potato scab.**—*Amer. Potato J.*, xii, 10, pp. 265–274, 2 graphs, 1935.

No evidence was yielded in the writers' recent experiments [the results of which are tabulated] on the relation of the hydrogen-ion concentration of the soil to potato scab (*Actinomyces*) [*scabies*] in New York State [*R.A.M.*, xiv, p. 716] that lime (as calcium oxide, sulphate, or carbonate) has any direct influence on the disease apart from increasing the alkalinity of the soil (a gravelly silt loam) [ibid., xiii, p. 537]. The incidence of infection was reduced by the admixture with the soil of excessively heavy applications of calcium oxide (30 or 60 gm. per 3,000 gm. soil), the proportion of clean tubers in the two series being

47 and 91 per cent., respectively, compared with none in the non-limed soil; these treatments brought the P_H values to 8·5 and 9, respectively, but they are probably impracticable on a large scale.

SETO (F.). **Beiträge zur Kenntnis der 'Bakanae'-Krankheit der Reispflanze.** [Contributions to the knowledge of the 'bakanae' disease of the Rice plant.]—*Mem. Coll. Agric. Kyoto* 36, 81 pp., 5 figs., 1 graph, 1935.

The outcome of the writer's five-year studies [full details of which are given and the resulting data tabulated] on the 'bakanae' disease of rice (*Gibberella fujikuroi*) in the Kyoto district of Japan [*R.A.M.*, xiv, p. 653; xv, p. 2] convinces him that descriptions of the symptoms in the phytopathological literature are to some extent misleading. The disorder is responsible, not only (as its name implies) for elongation but also for occasional stunting of the plants, while the fungus may also be present in the host without giving rise to any external signs of infection. Cultures of the organism isolated from all three types of diseased material proved capable of inducing the typical growth acceleration symptoms. In soil inoculation experiments elongated seedlings developed only under damp conditions, arrested growth being a feature of the infected plants in dry ground. Similar observations were made in respect of grain inoculation trials. In symptomless carriers of the disease the fungus is aggressive [cf. ibid., xiii, p. 390] but not virulent, and it is not so much the failure to contract the disease that distinguishes these carriers as the absence of reproductive organs of the fungus which naturally minimizes the risk of infection.

G. fujikuroi was inoculated with positive results into the stems of rice plants, infection occurring not only at or shortly after flowering but also, though not so profusely, at a much later date. The presence or absence of glumes did not appreciably influence the incidence of infection among the grains in panicles inoculated through the flowers. It was further shown that even externally sound grains may be heavily parasitized. Grain infection is predominantly, if not exclusively, of external origin.

In the 'bakanae' disease the host suffers from the combined effects of flower and seedling infection of the type described by Zade as 'flower-seedling infection' [ibid., viii, p. 559]. The symptoms induced by artificial inoculation through the flower are more clearly marked and correspond better with the natural features of the disease than those resulting from grain or soil inoculation. The optimum soil temperature both for growth and the development of infection in rice seedlings inoculated through the flowers was found to be 35° C.; 'bakanae' symptoms were still apparent at 25° but not as a rule at 20°, while at 40° only sparse germination of the infected seedlings occurred. *G. fujikuroi* develops well at a temperature range of 24° to 32°, with an optimum at 28°; at 35° growth is considerably slower. It is evident from these data that the maximum incidence of infection coincides, not with the optimum for mycelial growth, but with that for host development. At low soil temperatures the vigour of the seedlings arising from the grains of panicles inoculated through the flowers was impaired, and at the same time the 'bakanae' symptoms

were modified. The presence of the fungus, however, was established in these under-developed plants as well as in those of seemingly normal aspect. The individual examination of seedlings produced by flower-infected grain is regarded as essential to the solution of breeding problems, the systematic study of which is, however, still at the outset.

A six-page bibliography is appended.

VANDECAVEYE (S. C.) & ALLEN (M. C.). **Microbial activities in soil: II. Activity of specific groups of microbes in relation to organic matter transformation in Palouse silt loam.**—*Soil Sci.*, xl, 4, pp. 331–343, 4 graphs, 1935.

A detailed account is given of investigations carried out at Washington Agricultural Experiment Station into the activity of specific groups of micro-organisms and their functions in the transformation of organic matter in Palouse silt loam cropped for nine years continuously to wheat. In the course of the work it was found that during the first stages of decomposition of the organic residue in the soil a sequence of activity occurred, the bacteria leading as a group, but being closely followed by *Actinomyces* and fungi. As the number of fungi did not increase materially during the first four or five days they were presumably unable to compete with the other groups present at that time. The cellulose-decomposing bacteria and *Azotobacter* did not increase in numbers until the activity of these organisms had subsided. Both bacteria and *Actinomyces* as well as the fungi took an important part in the decomposition of the hemicellulose and cellulose compounds [*R.A.M.*, v, p. 763; xii, p. 393].

AJREKAR (S. L.) & OZA (J. D.). **Observations on Glomerella cingulata (Stoneman) S. & V. Sch. parasitic on Tinospora cordifolia Miers.**—*J. Univ. Bombay*, iii, 5, pp. 56–64, 2 pl., 1935.

The authors state that, besides being commonly attacked by a species of *Cercospora* [*tinosporae*: see next abstract], the leaves of *Tinospora cordifolia* (a plant much used in Indian medicine) also frequently bear slightly raised, dark dots, generally arranged in rings, consisting of acervuli of a species of *Colletotrichum* with conidiophores, 13 to 16 by 3 to 4 μ in diameter; slightly curved conidia, somewhat pointed at both ends [falcate], pink in mass, and measuring 16 to 17 by 3 to 4 μ; and numerous dark brown setae, 60 to 150 by 4 to 8 μ. This stage was shown to be genetically connected with *Glomerella cingulata* [cf. *R.A.M.*, xv, pp. 104, 109] the perithecia of which are formed on overwintered diseased *T. cordifolia* leaves in nature, and were also produced in cultures from single conidia on glucose-peptone agar, while mono-ascospore cultures developed the *Colletotrichum* stage. The perithecia formed both in nature and in pure culture measure 80 to 140 μ in diameter; the asci are clavate, sessile, 44 to 67 by 7 to 12 μ, and contain eight, roughly distichous, hyaline, continuous, and more or less curved ascospores, 13 to 19 by 4 to 7 μ. The pathogenicity of both stages to *T. cordifolia* was demonstrated by successful artificial inoculations.

Ajrekar (S. L.) & Oza (J. D.). **A study of Cercospora tinosporae Syd. and its associated pycnidial and perithecial stages.**—*J. Univ. Bombay*, iii, 5, pp. 65–78, 3 pl., 1935.

A widespread and severe disease of *Tinospora cordifolia* in the vicinity of Ahmedabad, characterized by the presence on the leaves of numerous, single at first but later coalescing, angular or irregularly elongated spots, powdery and white on the under and bright yellow on the upper surface, and 0·5 to 7 mm. in diameter, was shown to be caused by *Cercospora tinosporae* Sydow [see preceding abstract], recorded in 1916, from the Philippine Islands. The conidiophores are hypophyllous, hyaline, one- to three-septate, straight but often bent and geniculate, bearing a prominent scar at each geniculation, and 54 to 98 by 4 to 6 μ in diameter. The conidia are hyaline, long and slender (35 to 55 by 4 to 7 μ), rounded at the base and tapering at the apex, and 0- to (most commonly) 3-septate. In culture the fungus produced pycnidia of the *Phoma* type, 35 to 118 μ in diameter, very similar to those found during the winter on fallen, spotted *T. cordifolia* leaves (40 to 120 μ), the pycnospores being cylindrical or rod-shaped, and 4 to 7 by 3 to 4 μ both in culture and in nature. Overwintered *T. cordifolia* leaves affected with *C. tinosporae*, showed the presence on them in the spring of perithecia of the *Mycosphaerella* type, ascospores of which produced a sterile mycelium in culture, strongly resembling that of *C. tinosporae*, and indicating a genetic connexion between the three forms.

The pathogenicity of *C. tinosporae* could not be tested on *T. cordifolia* seedlings, since the majority of these, even when raised from surface sterilized seeds, developed the characteristic spotting, suggesting that the disease is seed-borne. Successful infections, with subsequent reisolation of the fungus, were obtained, however, from inoculations made on healthy cut branches and leaves of the host, all controls remaining healthy. The fungus penetrated the epidermal cell-walls directly, and did not enter through the stomata.

Unamuno (L. M.). **Notas micológicas. XI. Algunas especies interesantes di micromicetos de Vizcaya.** [Mycological notes. XI. Some interesting species of micromycetes from Biscay.]—*Bol. Soc. Esp. Hist. nat.*, xxxv, 8, pp. 423–436, 8 figs., 1935.

An annotated list is given of 36 species of fungi collected in the province of Biscay, Spain, in 1932 and 1934 [*R.A.M.*, xiv, p. 396], including four species and one variety considered to be new to science. *Melampsora larici-epitea* [ibid., xi, p. 756] was found on leaves of willow (*Salix nigricans*) (a new host for the country); *Peronospora cytisi* L. Rostrup on foliage of *Cytisus laburnum*; *Phyllosticta pirina* [ibid., xi, pp. 114, 159] on pear leaves; and *P. advena* Pass. on those of *Robinia pseud-acacia*, the three last-named being new to Spain.

Sphaeronema bustinzae n.sp. [with a Latin diagnosis], forming ellipsoid or angular, light brown, indistinctly delimited lesions on white clover (*Trifolium repens*) leaves, is characterized by globose or sphaeroidal-depressed pycnidia, 100 to 180 μ in diameter, with straight or flexuous beaks, 86 to 100 by 60 to 69 μ, with round ostioles, 10 to 16 μ in diameter, and a membranaceous sheath composed of polygonal

cells, 6·5 to 12 μ in diameter; and hyaline, continuous, cylindrical, straight or somewhat curved, pluriguttulate spores, 17 to 25 by 4 to 5 μ, rounded at both ends and slightly tapering at one. The same host is attacked by *Uromyces flectens*.

Fabraea maculata [ibid., xiv, p. 772] in its imperfect stage, *Entomosporium maculatum* (also new to Spain), causes severe damage to quinces, especially in damp situations.

GÄUMANN (E.) & JAAG (O.). **Über Kleinarten aus dem Formenkreis der Puccinia campanulae.** [On subspecies from the form-cycle of *Puccinia campanulae*.]—*Hedwigia*, lxxv, 3, pp. 121–129, 3 graphs, 1935.

On the basis of their examination of material of *Puccinia campanulae* sensu lato on various species of *Campanula* the authors subdivide the rust into six species as follows. *P. campanulae* on *C. rapunculus* (Swiss and German specimens) is retained as the type species; the light brown, broadly ellipsoid, smooth or verrucose teleutospores measure 19 to 36 by 10 to 22 μ, average 28·7±2·2 by 15·3±1·4 μ. The form occurring on *C. cochlearifolia* Lam. [*C. caespitosa* Scop.] in Switzerland and Germany differs from the foregoing in its larger and distinctly verrucose teleutospores (averaging 30·1±3·7 by 16·6±2·0 μ) and is named *P. rytzii* n.sp. *P. campanulae herminii* G. Fragoso on *C. herminii* in Spain is characterized by exceptionally wide and strikingly verrucose teleutospores, 29·2±2·2 by 18·0±1·6 μ. The teleutospores of *P. campanulae rotundifoliae* in Sweden and the United States measure 30·1±3·8 by 14·3±1·4 μ, the European material being partly smooth and partly verrucose and the American definitely verrucose. The light brown, long, very slender, verrucose teleutospores of *P. campanulae scheuchzeri* n.sp. in Switzerland (27 to 44 by 9 to 19 μ, average 35·5±2·0 by 13·7±1·4 μ) are a striking feature of this species. The teleutospores of *P. novae zembliae* Jørstad on *C. uniflora* in Greenland measure 35·9±2·2 by 19·4±1·7 μ.

PALM (B. T.). **Några parasitsvampar från södra Sverige.** [Some parasitic fungi from southern Sweden.]—*Bot. Notiser*, *1935*, 5, pp. 412–416, 1935.

The following are among the 84 parasitic fungi collected by the writer in southern Sweden in 1933 and 1934: *Peronospora pratensis* Syd. on *Trifolium medium*, *P. spinaciae* on spinach [*R.A.M.*, xiii, p. 266], *Taphrina cerasi* on cherry (*Prunus cerasus* and *P. avium*) [ibid., xiii, pp. 544, 706], *T. insititiae* on plums [ibid., xi, p. 424] (especially of the Johannes variety in Halland and Scania), *Gymnosporangium clavariaeforme* on *Crataegus oxyacantha* [ibid., ix, p. 754], and *Puccinia porri* on leeks [ibid., xiv, p. 735].

STANLEY (W. M.). **Chemical studies on the virus of Tobacco mosaic. IV. Some effects of different chemical agents on infectivity.**—*Phytopathology*, xxv, 10, pp. 899–921, 1935.

Of various chemicals tested for their action on the infectivity of purified preparations of the tobacco mosaic virus [*R.A.M.*, xiv, p. 659], 17 caused an increase and 46 a decrease of virulence, while 41 exercised

no significant effect [cf. ibid., xiv, p. 722]. The stimulatory influence of the first group, including dipotassium phosphate, sodium thiosulphate, phenolphthalein, pyridine, benzidine, l-menthol, and sulphur (all at 1 per cent.), is tentatively attributed either to their lowering of the hydrogen-ion concentration or (in the case of the three last-named) to their action as suspended particles. Three factors may be involved in the depressive effect, as gauged by the number of lesions arising from inoculation on *Nicotiana glutinosa* and *Phaseolus vulgaris* leaves, on the virus of the reagents comprising the second group, viz., oxidization induced, for instance, by 3 per cent. hydrogen peroxide, chloramine-T, potassium permanganate, potassium dichromate, iodine+potassium iodide (all at 1 per cent.), and saturated bromine; protein precipitation effected, e.g., by mercuric acetate, mercuric chloride, silver nitrate, lead acetate (all at 1 per cent.), and safranin (0·1 per cent.); and shifting the hydrogen-ion concentration to a point (exceeding P_H 10 or less than 3) injurious either to the virus [ibid., xv, p. 41], test plant, or both, a function, for example, of bromine and 1 per cent. diisoamylamine, ferric chloride, oxalic acid, picric acid, stannic chloride, and platinic chloride. The only chemical diminishing the virulence of the virus independently of these factors was 1 per cent. brucine.

The fact that the virus remained unaffected for lengthy periods by germicidal concentrations of mercuric chloride is considered to exclude it from the ranks of bacterial organisms. In purified preparations it was much more extensively affected by mercuric chloride at P_H 6, 7, and 8 than at 3, 4, and 5—results deemed to accord with recent evidence that the virus is a protein [ibid., xiv, pp. 260, 721].

As indicated above, dipotassium phosphate or phosphate buffers near P_H 7 markedly increase the infectivity of the tobacco mosaic virus towards *P. vulgaris*, whereas in the case of Turkish tobacco the effect may be reversed and in *N. glutinosa* the degree of virulence may be increased, decreased, or remain unchanged. The effect of charcoal on the infectivity of the virus was found to vary with the relative proportions of virus and charcoal in the inoculum. The virus was completely removable from the solution by adsorption with very finely divided charcoal at P_H 3 to 5.

STANLEY (W. M.). **Chemical studies on the virus of Tobacco mosaic. V. Determination of optimum hydrogen-ion concentrations for purification by precipitation with lead acetate.**—*Phytopathology*, xxv, 10, pp. 922–930, 1935.

The optimum hydrogen-ion concentrations for carrying out the three principal steps in the lead acetate process for tobacco mosaic virus [see preceding abstract] purification proposed by Vinson and Petre [*R.A.M.*, x, p. 761] have been determined as approximately P_H 9 for the lead subacetate precipitation, P_H 5·5 for the neutral lead acetate precipitation, and P_H 7 for the elution of the virus from the neutral lead acetate precipitate. A greatly increased virus yield was found to be obtainable by effecting the lead subacetate precipitation at P_H 9 instead of 6·5 as originally recommended. The modified process proved very useful in the rapid preparation of colourless, semi-purified solutions with a

virus concentration equal to, or somewhat exceeding, that of the starting material.

THORNBERRY (H. H.). **Effect of tannic acid on the infectivity of Tobacco-mosaic virus.**—*Phytopathology*, xxv, 10, pp. 931–937, 1935.

Tobacco mosaic virus [see preceding abstracts] at a 1×10^{-3} dilution in 0·1 molar phosphate buffers at reactions of P_H 10, 8·5, 7, 4·5, and 3 was treated with tannic acid at concentrations of 0·01 to 1 per cent. for periods of one minute to 20 days, at the end of which the infectivity of the virus was measured by the number of lesions developing on Scotia bean [*Phaseolus vulgaris*] leaves inoculated by rubbing with the suspension. The activity of the virus was found to be inhibited by a 1 per cent. solution of tannic acid in one hour in an alkaline medium and in 15 minutes in an acid one. The results of tests in which bean plants were inoculated with non-buffered virus at various dilutions indicated that infectivity, irrespective of virus concentration, was inhibited in 15 minutes at room temperature by 1 per cent. tannic acid, while in solutions of lower acid concentrations the activity of the virus, after an hour's exposure, was inversely proportional to the strength of the acid; after 5 to 20 days' exposure to a 0·5 per cent. solution the virus was non-infectious.

Partial restoration (up to 90 per cent.) of the infectivity of the virus was effected by ultrafiltration through collodion membranes (28·96 $\mu\mu$ pore diameter) retaining the virus but not the acid. Fifteen days' standing in 10 per cent. tannic acid did not permanently inactivate the virus. Another method of restoring activity consisted in precipitating the acid with gelatine, 1 per cent. of which caused the recovery of 24 to 64 per cent. infectivity in 5 to 60 minutes.

Applied to the host before inoculation, tannic acid in concentrations of 0·01 to 10 per cent. greatly reduced but in no case entirely prevented infection by the virus, the degree of inhibition being proportional to the concentration. Only a slight reduction in the virulence of the symptoms was effected by the application to the plants of tannic acid at the rates indicated above after inoculation with the tobacco mosaic virus.

KOCH (L. W.). **Recent investigations on Tobacco root rot in Canada.**—*Canad. J. Res.*, xiii, 3, pp. 174–186, 3 pl., 1 fig., 1935.

After referring to the economic importance of root rot of tobacco in the province of Quebec, the author gives a concise account of the results so far obtained in an investigation of the black rot (*Thielaviopsis basicola*) [*R.A.M.*, xiv, p. 403] problem, started in 1934. Direct microscopic examination of approximately 1,600 black-rotted tobacco roots growing under varying conditions in the seed-bed and in the field revealed the presence of several organisms, occurring singly, in various combinations with one another, or more especially, in frequent association with *T. basicola*. The fungi observed comprised the Phycomycetous 'mycorrhizal' fungus, representatives of the genus *Rhizoctonia*, including *R.* [*Corticium*] *solani*, as well as several forms of the type that occurs in orchids [ibid., xv, p. 108], *Asterocystis* (?) *radicis* [ibid., xiv, p. 362], and different species of *Pythium*. A brief description is given

of the development inside tobacco roots of the Phycomycetous endophyte which, in many respects, resembles that occurring almost universally in strawberry roots [ibid., xiii, p. 785]; daily examination of tobacco seedlings growing in soil infected with the fungus showed that 30 per cent. of the seedlings contained it in their roots five days after germination and that all were infected after ten days. The fungus was also found in mosses and liverworts (*Marchantia* sp.) [cf. ibid., xii, p. 235] growing in soil obtained from tobacco seed-beds.

Isolations from 206 typically diseased tobacco roots consistently yielded, apart from bacteria and nematodes, representatives of 21 genera of fungi [which are listed], in addition to *T. basicola*. The fungi most frequently isolated in association with the latter comprised 10 forms of *Pythium*, 7 of *Fusarium*, and 7 of *Rhizoctonia*. Of these, one form of *Rhizoctonia* of the *solani* type, three endophytes of the same genus, four forms of *Pythium*, and *T. basicola* were shown in preliminary inoculation experiments to be capable of attacking tobacco roots; the remainder, as well as the few species of Fungi Imperfecti which were isolated, showed no evidence of being parasitic on tobacco roots under the same experimental conditions.

Beach (W. S.). **Control of Tobacco wildfire. Second report.**—*Bull. Pa agric. Exp. Sta.* 322, 29 pp., 5 figs., 1935.

After pointing out that control methods based upon the maintenance of clean seed-beds have not prevented the development of wildfire (*Bacterium tabacum*) [see above, p. 138] in the Pennsylvanian tobacco fields, the author gives a full account of a comprehensive series of experiments made on the control of the disease. The reddish-brown, zonate spotting locally known as 'rust' that occurs after rainstorms is stated to be merely a manifestation of wildfire in which the characteristic yellow halo is lacking.

While failure to secure satisfactory control is often due to faulty seed-bed practices, four years' experiments on isolated field plots showed that the bacteria that overwinter in the field (chiefly in incompletely decayed parts of the plants) are an important source of infection. The disease survives at least one complete year in the field, and not more than two years in any form of storage. No evidence was obtained that the soil harbours the organism if the plant decays completely, and no plant was found to act as host for the bacterium in the absence of tobacco from the field, though *Physalis virginiana* was attacked when growing in proximity to the crop. Repeated experiments likewise failed to demonstrate that the tobacco flea beetle [*Epitrix parvula*] or the potato flea beetle [*E. cucumeris*] disseminate the disease.

Infection was found to be much reduced when tobacco is grown under shade cloth, largely owing to decreased rain-splashing and soaking of the leaves.

Emphasis is laid upon the importance of applying fungicides to the seed-beds early; complete prevention of the disease in contaminated beds is possible when the fungicides are applied at seed time or at the seed-leaf stage. Bordeaux mixture and copper-lime dust may safely be applied at seed time. Loss of stand, which results only when the seed has been sprouted in bulk, may be obviated by heavier sowing.

A spray of calomel [mercurous chloride] and milk powder (3 to 1 by weight) mixed with water prevents seed-bed infection as effectively as Bordeaux mixture, though calomel, by preventing the development of secondary roots near the soil surface, may cause stunting or delay maturity.

The danger of infection that results from the overwintering of the organism may be overcome by field sanitation and cultural practices designed to hasten the decay of tobacco refuse, while the usual four-year tobacco rotation assists control. Autumn ploughing may prevent the spread of the disease on sucker growth in autumn and the carriage by flowing surface water of infected refuse into clean fields.

The amount of wildfire originating in seed-beds and field sources, respectively, varies greatly from year to year, but as a rule the seed-beds are much the more important source of infection; in years of average rainfall severe losses are limited almost entirely to seed-bed infections. Very wet years increase the importance of the overwintering that takes place in the field and lead to the contamination of land on which tobacco is not being grown. Success in combating the disease requires a high degree of co-operation by the growers in the measures adopted, detailed recommendations for which are given based on the experimental evidence presented.

DAVIDSON (H. F.). **Bacterial wilt of Solanaceous crops.**—*Trop. Agriculturist*, lxxxv, 4, pp. 257–259, 1935.

In this brief, popular account of the symptoms and control of bacterial wilt of Solanaceous crops (*Bacterium solanacearum*) the author states that in Ceylon the susceptible hosts commonly cultivated include tobacco, tomato, eggplant, and chilli [*Capsicum annuum*: *R.A.M.*, xii, p. 77; xiii, p. 79]. Locally, the disease appears to be more severe on alkaline than on acid soils. Observations showed that the Porto Rican eggplant varieties Camuy and Long Green were highly resistant [ibid., xi, p. 29], the most resistant potato variety was Red Bliss Triumph, while on chilli pepper the least infection developed on the Chinese Giant, World Beater, Bull Nose, and Bolivian varieties.

The control measures recommended [cf. ibid., xiv, p. 658] include the selection of planting land never before sown to any susceptible host, the avoidance of alkaline fertilizers and excessive applications of lime and ash, the use of clean or disinfected seed, transplanting only when strictly necessary, and then when the plants are quite young, careful watering, removal of diseased material, plant débris, and susceptible weeds, and the practice of crop rotation. Susceptible weeds should not be allowed to grow on fallow land intended for Solanaceous crops.

SMITH (K. M.). **New virus diseases of the Tomato.**—*J. R. hort. Soc.*, lx, 10, pp. 448–451, 7 pl., 1935.

A description is given of three new virus diseases of the tomato which were identified in 1935 from material sent in from different parts of Great Britain, namely, a disease which was first observed in a commercial glasshouse in Somersetshire [*R.A.M.*, xiv, p. 724], and has been since recorded from several other localities, including

Belfast. In addition to symptoms already noticed the trouble is characterized by an almost complete cessation of growth. Under certain environmental conditions the diseased plants may assume a bushy or rosetted habit with malformed shoots and leaves. Ripe fruit exhibits a mottling or blotching of pale spots and ring-like marks on a darker background, while green fruit is apparently normal but of very poor quality.

The outstanding feature of the second disease, which occurred in the west of Scotland and at Cheshunt, is the extreme malformation of affected plants; in one type, the leaf blade is completely suppressed, so that the leaves often consist only of long, thin threads; in another, a large number of very small, closely packed leaflets, ending in a corkscrew tendril, gives the diseased plant a curious 'fern-leaf' [cf. ibid., xiv, p. 218] appearance; the apices of the leaflet teeth of individual leaves may be very considerably prolonged, producing a spidery effect, and enations and small additional leaves may be developed on the under side of the leaves. Diseased plants also show a tendency to excessive growth, so that under commercial conditions of cultivation they may present a striking appearance of leafiness and overgrowth; this is usually accompanied by a certain amount of dark and light green mottling on the leaves. This disease was commonly observed by the author on tobacco during a tour of the tobacco-growing districts of south-west France in 1934. The trouble is a very serious one for tomato growers, owing to the paucity and very poor quality of the fruits produced, and also to its infectious nature.

The third disease was reported from Ipswich, Felixstowe, and Bath, where it is widespread and serious. The symptoms are mainly of the mosaic type, but the mottling is different from that in all the other known mosaic diseases of the tomato. Young affected plants are of an abnormal green colour, with a faint greyish cast, and the leaves are banded with pale yellow and dark green. In older plants the chief symptom is the extreme yellowing of the lower parts of the plant, simulating nitrogen starvation. The ripe fruits are mottled with spots of yellow and pale green. Various tests on a range of host plants showed that this disease is due to a different virus from those causing the other two diseases.

A brief discussion is also given of the possible origin of these diseases, and the paper terminates with some recommendations of possible measures for their control.

Van Schreven (D. A.). **Virusziekten van de Tomaat.** [Virus diseases of the Tomato.]—*Tijdschr. PlZiekt.*, xli, 10, pp. 261–300, 4 pl., 1935.

The only virus diseases of tomato definitely known to occur in Holland are stated to be ordinary mosaic (tobacco virus 1), some obscure forms of streak [*R.A.M.*, xv, p. 122] observed only once, and the so-called 'Huissen' disease, named after the locality of its origin. An attempt is here made to summarize from contemporary literature the outstanding points of recent investigations on the following disorders: ordinary mosaic, aucuba mosaic (tobacco virus 6) [see above, pp. 168, 178], spotted wilt [ibid., xv, p. 65 and next abstract], mixed

virus streak, glasshouse streak (tomato streak virus 1) [ibid., xv, p. 122], all found in Europe, stem necrosis streak (tobacco virus 9), ring mosaic streak (America) [ibid., xiv, p. 261], big bud (Australia) [ibid., xiv, p. 131], and bunchy top (South Africa) [ibid., xv, p. 124]. Mention is further briefly made of yellows or curly top [ibid., xv, p. 123] (United States), 'stolbur' or woodiness (Crimea), and narrow leaf [ibid., xiv, p. 262].

The Huissen disease, which affected a few Ailsa Craig tomatoes both in 1933 and 1934, is characterized by sharply delimited, bronze-coloured areas following the leaf veins and occasionally assuming the shape of rings, asymmetrical development of the leaves with curling of the margins, production of lateral shoots to replace the necrotic tops, premature death of the buds and flowers, and a few circular lesions on the fruits, less distinctly defined than those of the possibly related spotted wilt. In 1934 five plants each of Ailsa Craig tomato, White Burley tobacco, and Spanish pepper [*Capsicum annuum*] were inoculated with undiluted sap from two tomato plants infected by grafting in the previous year. All the tobacco plants developed the typical Huissen disease symptoms, and all the peppers ceased growth three weeks after inoculation. Only one out of the five tomato plants, however, showed the above-mentioned bronze discolorations, the remainder (as well as the peppers) contracting the symptoms of ordinary tobacco mosaic, which was evidently one of the components of the inoculum and predominated in the transmission tests.

A five-page bibliography is appended.

McWhorter (F. P.) & Milbrath (J. A.). **The interpretation of Oregon tip blight on a basis of causal viruses.**—Abs. in *Phytopathology*, xxv, 9, pp. 897–898, 1935.

Since 1930 a tomato disease locally known as 'tip blight' is stated to have been of great economic importance in the southern Oregon canning areas. The most noticeable symptom is severe blighting of the terminal shoot, which kills young plants and rapidly inhibits the production of marketable fruit by older ones. Two viruses, namely, that of spotted wilt [see preceding abstract] and an undetermined one, appear from inoculation tests to be implicated in the causation of tip blight. The undetermined virus is very difficult to transfer from tomato to tomato, and has so far failed to produce symptoms on any other Solanaceous host. On tomato it is highly destructive, being selectively active on the terminal shoots and first manifested by necrotic, black lesions on the leaves.

Arnaud (G.) & Barthelet (J.). **Maladies des arbres d'ornement.**—[Diseases of ornamental trees.]—*Rev. Path. vég.*, xxii, 4, pp. 245–250, 2 pl., 1935.

The results of experiments in 1935 at Versailles, in which approximately three-year-old nursery plants of a number of ornamental trees were inoculated through wounds in the trunk with pure cultures of *Fusicoccum cedrelae* isolated from *Cedrela sinensis* [*R.A.M.*, xiii, p. 479], showed that *Robinia pseud-acacia*, as well as the *monophylla* form of this species, are highly susceptible to the fungus, since the lesions

which developed on them within five or six weeks were much more extensive and penetrated more deeply into the wood than on *C. sinensis*. While not yet conclusive, this result is considered to add weight to the suggestion made by the authors in their previous communication [loc. cit.] that the *Cedrela* fungus may be identical with the *Phomopsis* stage of *Diaporthe oncostoma*. The question of the pathogenicity of the fungus to the other tree species tested is reserved for future discussion.

In parallel experiments with *Verticillium dahliae* from *Ailanthus glandulosa* [ibid., xi, pp. 95, 550, and cf. also p. 755] well-defined lesions developed within five or six weeks on *A. glandulosa* and *Koelreuteria paniculata*, the results on the other species tested being so far indefinite, while the inoculation wounds on *R. pseud-acacia* were apparently entirely healed without any trace of infection.

Stapp (C.) & Bortels (H.). **Mikrobiologische Untersuchungen über die Zersetzung von Waldstreu. II. Mitteilung.** [Microbiological studies on the decomposition of the forest cover. Note II.]—*Zbl. Bakt.*, Abt. 2, xciii, 1–4, pp. 45–56, 1935.

All the tannin-decomposing fungi isolated from the cover and soil of conifer and beech forests in different parts of Germany were found to belong to the genera *Aspergillus* and *Penicillium*, ten species belonging to the *Citromyces* section of the latter, e.g., *P. thomii*, and *A. niger* being particularly active in this respect. Diagnoses are given in German of these ten species, five of which are considered to be new to science. *A. niger* was extensively represented in the very fertile, calcareous beech and spruce forest soils in the neighbourhood of Göttingen.

Inland-Rundschau. Bremen. [Inland review. Bremen.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 42, p. 520, 1935.

The dying-off of elms from graphiosis [*Ceratostomella ulmi*] at Bremen is stated to be proceeding continuously, notwithstanding the scrupulous observance of measures for the protection of the remaining healthy trees [*R.A.M.*, x, p. 752]. Five to seven years ago some vigorous young elms were interplanted with the severely infected old stands, and so far adequate resistance has been shown by *Ulmus montana fastigiata*, *U. vegeta*, and *U. superba* (*praestans*). Two individuals of *U. sarniensis* (*wheatleyi*), hitherto sound, had to be cut down on account of infection during 1935. A planting of *U. vegeta*, dating from 1898, is still healthy, while a few diseased *U. pittieriana* trees interspersed among the stand have been removed. Some 30-year-old specimens of *U. umbraculifera* in a neighbouring village are still healthy whereas the adjoining stands of *U. campestris* have had to be felled [ibid., xv, p. 126 and next abstract].

Noell. **Nochmals Ulmenkrankheit.** [Elm disease again.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 48, pp. 590–591, 1935.

At Crefeld [Rhine], where the dying-off of elms from graphiosis [*Ceratostomella ulmi*: see preceding abstract] was first observed, there were 2,979 elms in the streets at the onset of the disease, which has since attacked 2,315 of the total number. Eight and ten years ago

several streets were replanted with elms, which were also grown for experimental purposes in the municipal nursery. The varieties used were *Ulmus montana* and its vars. *fastigiata* and *umbraculifera*, *U. sarniensis*, and *U. vegeta*. To-day practically nothing but stumps are left in consequence of infection, a fair degree of resistance to which was shown at the outset by *U. montana fastigiata*.

Dodge (B. O.). **The situation regarding Dutch Elm-disease, the Japanese beetle, and the gypsy moth at the Botanical Garden.**—*J. N.Y. bot. Gdn*, xxxvi, pp. 247–252, 1935.

In this note on the progress of the Dutch elm disease [*Ceratostomella ulmi*: *R.A.M.*, xv, p. 130] eradication campaign in New York State the author points out that every elm in the region covered by the official survey (about 150 sq. miles), is inspected once a month during the summer. Reports on suspected material are issued within a week and affected trees are destroyed within three weeks. So complete is the public co-operation in the campaign that not one legal action has arisen in work involving the destruction of thousands of trees. Two or three more years must elapse before it can be known with certainty whether the measures taken will eventually prove successful.

D'Oliveira (B.). **Phytopathological notes.**—*Rev. agron.*, xxiii, 1, pp. 50–51, 1935.

The effect of tannic acid on the growth of orange rust (*Endothiella gyrosa* or the pycnidial form of *Endothia fluens*) [*R.A.M.*, xi, p. 611], which infects the cork layer of the cork oak [*Quercus suber*] in Portugal, was tested on a synthetic medium containing 0·1, 0·5, 1, 2·5, and 5 per cent. tannic acid (Merck). The average dry weights of the resulting cultures were 0·679, 0·566, 0·443, 0·250, and 0 gm., respectively. The fungus in this medium is acidogenic in contrast to the alkalizing tendency of *Fusicladium dendriticum* [*Venturia inaequalis*], *F. pirinum* [*V. pirina*], and *F.* [*dendriticum* var.] *eriobotryae* [ibid., xiv, p. 777] on a substratum of almost the same composition. These organisms made no development in the presence of 0·5 per cent. tannic acid at P_H 3·22 but all grew at 0·01 per cent., and at P_H 3·18 with 0·05 per cent. malic acid.

Laubert (R.). **Eine Schwarzfleckenkrankheit des Ahorns.** [A black spot disease of the Maple.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 42, pp. 514–515, 1 fig., 1935.

A note is given on the black spot of maples, hitherto known with certainty only from the Sudetic Alps and from Denmark, caused by *Euryachora rhytismoides* [*R.A.M.*, viii, p. 274], the macroscopic and microscopic differences between which and the widespread *Rhytisma acerinum* [ibid., xiii, p. 280] are briefly indicated.

Priehäusser (G.). **Beitrag zur Frage der Entstehung der Fichtenrotfäule.** [A contribution to the problem of the development of red rot of Spruce.]—*Forstwiss. Zbl.*, lvii, 20, pp. 649–655, 1935.

The extreme liability of spruce stands in the East Zwiesel silvicultural district of the Bavarian Forest to red rot [*Fomes annosus*: *R.A.M.*,

xiii, p. 137; xv, p. 68] is explained by the writer on an ecological and microbiological basis.

Under local conditions the tree is of the shallow-rooting type, unable to penetrate through the thick humus to the mineral strata of the soil and largely dependent, therefore, on the aid of fungal symbionts for its nutrition from the soil cover, mainly consisting near the fringes and in the eastern portions of the stands of xerophile mosses, e.g., *Hyloconium splendens* and *Dicranum scoparium*, in which the mycorrhiza are unable to develop, with the result that the spruce roots die off and rot. Towards the interior moister conditions are signalized by the copious growth of *Sphagnum acutifolium* and *Polytrichum formosum*, in the presence of which the mycorrhiza make satisfactory growth and the tree roots remain healthy. A sure sign of microbiological activity in the soil cover is the abundant development of a *Marasmius* occurring on spruce needles. The accumulation of heavy, acid humus leads to deterioration, or at any rate to thickening and acidification, of the soil, and as the trees grow older there is an increasing tendency to desiccation of the upper soil layers; mycorrhizal activity is reduced, the vitality of the trees is impaired, and red rot ultimately finds its way into the trunk.

The possibility of transforming the local pure spruce stands into mixed spruce, fir, and beech woods—the natural type for these particular soil conditions—is briefly considered.

Robertson (W. A.). **Report of the Director of Forest Products Research for the year 1934.**—*Rep. For. Prod. Res. Bd, Lond., 1934*, pp. 3–52, 2 pl., 1 fig., 1 diag., 2 graphs, 1935.

In 1934, a test was made at the Forest Products Research Laboratory, Princes Risborough, to determine the effect of *Ceratostomella coerulea* [or *Ophiostoma coeruleum*: *R.A.M.*, xiv, p. 274] on the strength of the sapwood of Scots pine [*Pinus sylvestris*]. After about six months' incubation, though no reduction in strength under gradually applied bending loads was apparent, there was a reduction of about 20 per cent. in the strength when the loads were applied suddenly, together with a reduction of about 10 per cent. in hardness on the side grain. The experiment could not be continued longer than six months as the test pieces became contaminated with moulds.

An investigation of the effect of *Polyporus hispidus* [ibid., xiii, p. 666] on the strength of ash showed that the fungus reduces the strength and stiffness in static bending at approximately uniform rates, the reductions amounting to 36 and 15 per cent., respectively, after 36 weeks' incubation. The maximum crushing strength was reduced by about 13 per cent. in 24 weeks. The strength under suddenly applied bending loads, i.e., 'toughness', was reduced by about 20 per cent. after two weeks, before any discoloration or disintegration had become apparent; the reduction reached 40 per cent. after 4 weeks' and 90 per cent. after about 15 weeks' incubation, respectively.

As the creosoted railway sleeper made of Baltic fir [*Picea excelsa*] that is used in England has an average life of only 18 to 25 years on a main line [cf. ibid., xiv, p. 545], an investigation was begun of the suitability for railway sleepers of certain species of timber grown in

the British Isles and of the possibility of reducing the cost of treating the sleepers while maintaining or extending their life.

The exceptionally dry conditions prevailing during the summer of 1934 were unfavourable for the development of dry rot [*Merulius lacrymans*: ibid., xiv, p. 136] in the experimentally constructed house, and owing to a general drying-out of the sub-soil, conditions became too dry for fungal growth, even in the badly constructed floors. The first experiment with various types of solid floors was concluded; the results obtained showed that the only satisfactory type of solid floor is one that includes some effective damp-proof course between the concrete and the boards, and that this is probably best provided by a thick layer of poured bitumen directly under the boards.

Further evidence showed that the fungus provisionally identified as *Fomes cryptarum* [loc. cit.] is fairly widely distributed and can cause serious decay under favourable circumstances; infected wood is very readily attacked by the death-watch beetle [*Xestobium rufovillosum*].

In an attempt to discover a suitable toxic agent that can be added to paint to prevent the growth of moulds [cf. ibid., xv, p. 40] tests are being made with a number of substances. The problem offers some difficulty, as the oil in the paint inactivates the greater part of any toxic substance added and many antiseptics are useless on account of their early evanescence or their effect on the setting of the paint film.

Experiments were also initiated on the control of sap-staining of timber by chemical treatment [ibid., xv, p. 69] and the efficacy of some thirty proprietary wood preservatives intended for surface application. Progress is also reported in the identification and physiology of wood-destroying fungi. Rudge's views on the chemical decay of timber [ibid., xiv, p. 543; xv, p. 131] are criticized and it is pointed out that fungi have repeatedly been shown to be capable of attacking wood *per se* under suitable conditions.

Bryan (J.) & Richardson (N. A.). **Experiments on the preservation of mine timber. Progress report No. 1.**—*For. Prod. Res. Rec., Lond.*, 3, 10 pp., 3 pl., 2 graphs, 1935.

Although timber to the value of some £6,000,000 is used annually in the mines of the United Kingdom, it is estimated that less than 2 per cent. is given any preservative treatment. The experiments herein described were undertaken at two pits, one near Nottingham (Pinxton Collieries) and the other at Portobello, Edinburgh (Niddrie and Benhar Coal Co.), to demonstrate the economy and advantages of preservative treatment applied to mine timber.

Fungi were prevalent in both pits, chiefly *Merulius lacrymans* and *Poria vaporaria*, other species represented including *Coniophora cerebella* [*C. puteana*], *Paxillus panuoides*, *Fomes annosus*, *Polystictus versicolor* [*R.A.M.*, xiv, p. 413], and *Lentinus lepideus*. Both the hot and cold open-tank impregnation processes were used, the Scots pine [*Pinus sylvestris*] props being immersed in the preservatives (sodium chloride 10, 8, 5, and 3·5 per cent., zinc chloride 5 and 2, sodium fluoride 4 and 2, and Wolman salts or triolith [ibid., xii, p. 262], consisting of 80 per cent. sodium fluoride, 6 per cent. dinitrophenol, 5 per cent. sodium dinitrophenate, and 8 per cent. potassium dichromate)

for a period of 1½ to 1¾ hours at 180° F. Creosote of the coke oven type was also used at Nottingham.

The experiments are still in the early stages and the results to date do not therefore permit of definite conclusions as to the respective merits of the treatments, but it is evident that the best protection is so far being secured with the more expensive preservatives, triolith (£70 per ton) and sodium fluoride (£50 per ton). Even sodium chloride (£4 per ton), however, doubles the life of the timber at a conservative estimate. In the case of the dearer preservatives, a 2 per cent. solution would seem to be sufficiently concentrated, in which case the treatment of a 6 ft. prop with triolith would amount to less than 3*d.*, inclusive of labour.

Rabanus (A.). **Augenblicklicher Stand der Holzschutztechnik.** [The position at the present moment of the timber protection technique.] —*Chemikerztg*, lix, 79, pp. 801–803, 1935.

The present situation of the timber impregnation industry in Germany is reviewed, with notes on the various treatments in current use (of which coal-tar is stated to be still the most popular) and on certain improvements designed to increase their utility. Most of the work referred to has been noticed from time to time [*R.A.M.*, xiii, p. 667 *et passim*].

Walker (J. C.). **Diseases of vegetable crops.**—65 pp., Ann Arbor, Michigan, Edwards Brothers, Inc., 1935. [Mimeographed.]

In this work, intended to serve as a reference text for an advanced course in vegetable pathology, the author succinctly outlines the most important facts concerning the major diseases of 19 vegetable crops, the notes being arranged generally under the following headings: hosts, history, occurrence, economic importance, symptoms, causal organism and its life history, pathological histology, environmental factors, varietal resistance, control, and bibliography. Some of the pertinent facts relating to the production of many of the crops are given and many minor diseases are listed.

Chupp (C.) & Pirone (P. P.). **Some notes on fungi causing diseases of Cabbage and other crucifers.**—*Plant Dis. Reptr*, xix, 17, p. 275, 1935. [Mimeographed.]

Chinese cabbage [*Brassica chinensis*] leaves received from Long Island in September, 1935, were found to be covered with a profusion of the circular to subcircular, pale tan to greyish spots characteristic of *Cercosporella albo-maculans* (Ell. & Ev.) Sacc. [*R.A.M.*, vii, p. 214]. The conidia were also identical with those of that organism, but the conidiophores were distinctly coloured like those of *Cercospora* [cf. ibid., xv, p. 59], this feature being also conspicuous in material collected on turnip in Mississippi in 1919. *C. albo-maculans* was transferred by Saccardo to *Cercosporella* because of its hyaline conidiophores, a characteristic borne out by the type material, but it would appear that the crucifer fungus resembles certain other species of *Cercospora*, e.g., *C. rosae* [ibid., ix, p. 37] and *C. pyri* Farlow in the indiscriminate

production of either coloured, hyaline, or partially tinted conidiophores.

An examination of the type material of the species described by Peck (*Rep. N.Y. St. Mus.*, xxxv, p. 140, 1884) as *C. lepidii* shows the fructifications to be those of *Macrosporium herculeum* [*Alternaria brassicae* (Berk.) Bolle: *R.A.M.*, xiv, p. 486]. The same applies to the specimen labelled by Sydow in 'Mycotheca Marchica' (3087) as *C. bizzozzeriana* Pass. on *Lepidium*.

Tompkins (C. M.), Tucker (C. M.), & Gardner (M. W.). **A Phytophthora root rot of Cauliflower.**—Abs. in *Phytopathology*, xxv, 9, pp. 893–894, 1935.

Winter plantings of cauliflower in the low-lying, poorly drained coastal areas of central California are stated to suffer from root rot (*Phytophthora megasperma*) [*R.A.M.*, xiii, pp. 25, 180], which induces reddening or purpling of the leaves, sudden wilting, and invasion and decay of the root system in plants of all ages. The incubation period of the fungus in seedlings in the open at 14° to 20° C. was about three weeks, and positive results were given by inoculation tests with the reisolated organism. On malt extract-agar the pathogen made the best growth at 19° to 22°. Natural infection occurs on Brussels sprouts, cabbage, and stock (*Matthiola incana*), the last-named and wallflower (*Cheiranthus cheiri*) also responding to artificial inoculation. The oogonia and oospores of the fungus are slightly smaller than those of *P. megasperma*, but the difference is regarded as too trifling to justify a separation. Both amphigynous and paragynous antheridia are formed, the latter predominating; the rare sporangia are non-papillate.

Ramsey (G. B.) **Peronospora in storage Cabbage.**—*Phytopathology*, xxv, 10, pp. 955–957, 1 fig., 1935.

Attention is drawn to the recent occurrence on 15 to 40 per cent. of the stored cabbages in a Wisconsin storehouse of an extensive greyish-black discoloration of the stems and heads due to *Peronospora parasitica*, recorded as the agent of a similar rot of cabbage in Holland [*R.A.M.*, v, p. 643; cf. also ibid., xiv, p. 546] and of turnips in the United States (*Phytopathology*, x, p. 321, 1920). In addition to the damage caused by the downy mildew itself, the affected cabbage tissues are very susceptible to secondary bacterial and fungal invasion, e.g., by *Alternaria* [ibid., xv, p. 70] and *Rhizopus*. Under Dutch conditions *P. parasitica* overwinters on plant débris in the field and it may possibly do so also in Wisconsin.

O'Brien (D. G.) & Dennis (R. W. G.). **Raan or boron deficiency in Swedes.**—*Scot. J. Agric.*, xviii, 4, pp. 326–334, 3 pl., 1935.

'Raan' is the name applied in Dumfriesshire and Galloway to a disorder of swedes occurring throughout the south-west of Scotland, which has been ascertained to be identical with that known in Canada as 'brown heart' [*R.A.M.*, xiv, pp. 70, 547, 669]. The symptoms of the disease are described in detail, and it is stated that the brown discoloration appears to be associated with a slight swelling of the middle lamella of the parenchymatous cell walls.

The feeding value of a raan-affected crop is considerably impaired, comparative analyses of healthy and diseased swedes having shown a decrease in the latter of 3 to 4 per cent. soluble carbohydrates and 12 per cent. sugar. All the purple-topped varieties are more or less susceptible to raan, with the possible exception of Garton's White-fleshed, while the relatively resistant Golden succumbed to the disease under adverse soil conditions induced by heavy liming. It was found that the resistant varieties have larger root systems, with a higher proportion of fibrous roots, than susceptible ones.

In water culture experiments the omission of manganese seriously affected the growth of turnip seedlings but did not induce symptoms of raan. The omission of boron from the culture solution, however, resulted in the development of the trouble, while the application of borax [see next abstract] to the soil at the rate of 20 lb. per acre caused a reduction of the disease from 70 and 40 per cent. in field experiments in Kirkcudbrightshire and Dumfriesshire, respectively, to nil. In order to obviate the risk of injury to the crop, farmers are advised not to apply borax at rates exceeding 20 lb. per acre and to mix this amount with a finely divided inert filler to raise the bulk to at least 1 cwt. per acre before use.

HØNNINGSTAD (A.). **'Vattersott' hos Kålrot skyldes bormangel.** ['Dropsy' in Swedes is due to boron deficiency.]—Ex. *Meld. Stat. Forsøksgård Forus 1934*, pp. H35–H38, 1935.

No parasitic agent having been detected in association with the so-called 'dropsy' of swedes in Norway, characterized by a more or less extensive yellow to dark, greyish-brown mottling of the inner root tissues, experiments have been conducted during the last three years to determine the influence of fertilizers on the course of the disorder. In 1934 boric acid was included in the trials at rates of 0·5 to 5 kg. per decare, with the result that even the smallest quantity gave practically complete, and the remainder absolute, control [cf. preceding abstract]. On the other hand, plots receiving ordinary fertilizers (especially potash) yielded only a small proportion (8 to 10 per cent.) of edible material. Borax, which is applied against heart and dry rot of beets [see next abstract], is easier to apply than boric acid, the former being soluble in cold water while the latter requires boiling water (6 to 8 l. per kg.); borax, however, contains about ⅓ less boron than boric acid, so that 1½ times as much must be used. The retail price of the latter at Stavanger is Kr. 0·75 [about 10*d.*], so that borax would have to be procurable at Kr. 0·50 to be commercially advantageous.

MEYER-HERMANN (K.). **Erfolgreiche Bekämpfung der Herz- und Trockenfäule der Rüben durch Borax!** [Successful control of heart and dry rot of Beets by borax!]—*Kranke Pflanze*, xii, 10, pp. 151–153, 1 pl., 1935.

Since 1932 extensive tests have been in progress at the Harleshausen Plant Protection Station, Kurhessen, in the control of heart and dry rot of beets by the application of borax at varying rates [*R.A.M.*, xv, p. 71], the areas covered in 1933, 1934, and 1935 being approximately 1,250, 2,500, and 5,000 acres, respectively. The so-called 'technical'

borax powder has proved uniformly more suitable for the object in view than the fine but readily coagulating pure borax or boric acid [cf. preceding abstracts]. The former has been applied at the rate of 5, 10, 15, 20, 25, 30, and 40 kg. per hect., after mixing four or five times with 1 doppelzentner [100 kg.] 40 per cent. potash. The best results, both as regards sugar content and dry weight, have generally been obtained with 15 or 20 kg., but the beneficial effects even of the minimum quantity were distinctly noticeable. The average increase of yield from the treatment amounted to between 50 and 100 doppelzentner beets per hect. [40 and 80 cwt. per acre] (280 dz. in one case) for an average outlay of only M. 4·50 to 6. Used at a rate in excess of 20 kg. borax tends to reduce the sugar content and to some extent the yield. The best time for application is the end of April or early May, followed by further treatments at the end of May and end of June. Bor-superphosphate and bor-am-sup-ka [ibid., xiv, p. 613] 6×8×12 (ready mixed) should be used at 3 and 6 doppelzentner, respectively, to correspond to 15 kg. borax (4 and 8 doppelzentner, respectively, for 20 kg.).

De Haan (K.). **Beschouwingen over de practische Suikerbietenteelt. V. Ziekten en vijanden van de Bieten en hun bestrijdingswijze.** [Observations on practical Sugar Beet cultivation. V. Diseases and pests of Beets and their control.]—*Meded. Inst. Suikerbiet., Bergen-o.-Z.*, 6, pp. 151–166, 1935.

Notes are given on the symptoms, etiology, and control of a number of diseases attacking beets in Holland. Seed disinfection against root rot (*Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis*) [*R.A.M.*, xiv, p. 548] is stated to have become a matter of general routine. Good results are obtained by dusting with UT 685 at the rate of 8 gm. per kg., two hours' immersion in 0·5 per cent. germisan, and the short disinfection process with 2·5 l. of a 3 per cent. germisan solution for 20 kg. of seed. Great care should further be taken to prevent the incrustation of the soil, which impedes the rapid growth of the plants and so exposes them to infection; for this purpose sodium nitrate should be replaced by calcium nitrate or calcium ammonium nitrate. Thorough drainage is also essential.

Girth scab (*Oospora cretacea*) [*Actinomyces* spp.: ibid., xiii, p. 288; xiv, p. 548] appears about the middle of June, when the leafy crowns of the plants, broken off just above soil-level, may be blown through the fields by strong winds.

Excellent control of the very prevalent manganese deficiency disease [ibid., xiv, p. 549] is given by the treatment of the plants with manganese sulphate solution at a maximum concentration of 1·5 per cent., this method being considered preferable to strewing the substance along the rows at the rate of 15 kg. per hect. A repetition of the former treatment after about five weeks is necessary. It is estimated that a 4 to 5 per cent. increase of yield may be secured by these methods. The writer's work on the control of heart rot [see preceding abstract] by the use of borax has already been summarized [ibid., xiv, p. 733].

Considerable damage is caused to the seed beet crop, especially in northern Holland, by downy mildew (*Peronospora schachtii*) [ibid., xi,

p. 419; xiv, p. 548]. Diseased individuals should be immediately removed and Bordeaux mixture applied. The other diseases described are rust (*Uromyces betae*) [loc. cit.], yellowing, including the form due to *Verticillium* [ibid., xiv, p. 549], mosaic [loc. cit. and next abstract], leaf spot (*Cercospora beticola* [ibid., xiv, p. 813], violet root rot (*Rhizoctonia violacea*) [*Helicobasidium purpureum*: ibid., xiv, p. 548], crown gall (*Bacterium tumefaciens*) [see above p. 133], *Bacillus betae* [ibid., v, p. 208], and the storage of rot caused by *Sclerotinia libertiana* [*S. sclerotiorum*: ibid., xi, p. 489].

Adam (D. B.) & Pugsley (A. T.). **A yellow bacterium associated with 'halo blight' of Beans.**—*Aust. J. exp. Biol. med. Sci.*, xiii, 3, pp. 157–164, 1 fig., 1935.

A yellow bacterium consisting of motile, Gram-negative rods, 0·8 by 0·5 μ, growing rapidly on beef extract-agar and other standard media, liquefying gelatine, fermenting glucose and saccharose with acid but no gas formation, and reducing nitrates, has been found commonly associated with the lesions of halo blight (*Phytomonas* [*Bacterium*] *medicaginis phaseolicola*) [*R.A.M.*, xiv, p. 733], which is stated to be much the most destructive and widespread disease of French beans (*Phaseolus vulgaris*) in Victoria. By closely following the pathogen the yellow bacterium may become systemically distributed within the host and modify the symptoms of the disease. Thus, if the yellow bacterium is mixed with *Bact. medicaginis phaseolicola* at the time of inoculation, the blight symptoms are retarded and their severity mitigated. A similar organism was isolated from mulberry (*Morus rubra*) blight (*P.* [*Bact.*] *mori*) [ibid., xiii, p. 748] lesions which, on simultaneous inoculation with *Bact. medicaginis phaseolicola* into beans, produced the same modifications as the yellow bacterium from halo blight spots. It has also been found occasionally in lesions on gladiolus, stock [*Matthiola incana*], oleander, and soy-bean.

Severin (H. H. P.) & Freitag (J. H.). **California Celery mosaic diseases.**—Abs. in *Phytopathology*, xxv, 9, p. 891, 1935.

Western celery mosaic and celery calico are the common names proposed for two celery mosaic diseases with different symptoms and host ranges in California. The features of western celery mosaic resemble those of southern celery mosaic (celery virus 1) [*R.A.M.*, xiv, p. 615] but the viruses differ in host range, while calico is readily distinguishable in the field by the green and amber mottling of the outer foliage, rarely affecting the younger leaves. Five of the ten species of aphids transmitting the two diseases are known to breed on celery under natural conditions. The melon aphid, *Aphis gossypii*, conveys both by contamination of mouth parts; each virus was transmitted by single, previously non-infective aphids of this species after five minutes' feeding on diseased, and the same period on healthy, plants. An undetermined aphid transmitted the western celery mosaic virus in four to seven hours. Large populations of different species of aphids reared on western celery mosaic plants and transferred daily to healthy individuals transmitted the virus on the first day but not subsequently.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, vii, 9, pp. 176–177, 189–200, 1935.

Germany (Prussia. Province of Saxony). In accordance with an Order coming into force on 31st August, 1935, and ceasing to operate on 31st December, 1940, all one- two-, and three-year-old asparagus plantings in the Osterburg administrative district of Saxony must be inspected between the beginning and 23rd June for the presence of asparagus rust [*Puccinia asparagi*: *R.A.M.*, xiv, p. 811] and the diseased portions, together with volunteer plants in fields, ditches, railway embankments, and the like, cut out and burnt or deeply buried by the latter date at latest. A copper-lime preparation prescribed by the Plant Protection Service must be applied three times at three- to four-weekly intervals to all plantings that have not reached the cutting stage, the date of commencement to be annually announced in the official journal.

Jugo-Slavia. By a Decree of the Ministry of Agriculture of 19th August, 1935, potatoes imported into Jugo-Slavia must be accompanied by a certificate stating that the produce is free from wart disease (*Synchytrium endobioticum*) [ibid., xi, p. 272] and originates in an area surrounded by a protective zone of 10 km. from which the fungus is also absent. This restriction does not apply to new potatoes from countries not infested by wart disease, which may be sent without a certificate up to 31st May in any year. The charge for official inspection by phytopathological experts of potato consignments entering the country is 2 dinar [about 1¾*d.*] per sack of 100 kg.

A Decree of the same date regulates the commerce in plant protectives in Jugo-Slavia. Only the manufacture, importation, and sale of substances approved by the Ministry of Agriculture is permitted and this approval is given only on the results of chemical and biological tests of the preparations, except that the sale of copper sulphate (98 per cent. purity), ground sulphur (60° Chancel), ventilated sulphur (80° Chancel), stick sulphur, and iron sulphate (98·5 per cent. purity) is permitted without special sanction. Requests for the testing of any substance must be accompanied by the following information: (*a*) the name of the preparation, (*b*) the name of the manufacturer, (*c*) its quantitative composition, (*d*) its physical properties, e.g., fineness, stability of emulsion, (*e*) a list of diseases or pests, with their hosts, against which it is intended for use, and (*f*) directions for use. The requisite quantity of material for testing must be supplied free of cost. The tests, both analytical and biological, are carried out at two Government institutions and must be completed within 3 years from the date of application. Persons requesting tests must pay all expenses as regulated by the Ministry. The results of the tests are communicated to the Ministry of Agriculture which then issues or withholds the approval required. All preparations allowed to be sold must bear labels indicating the name and manufacturer, the chemical character of the product, viz., whether mercurial, arsenical, and the like, whether poisonous or not, the net weight, the date of approval, and other information supplied when the request for testing was made.